FLOATING DOCK AT BROOKLYN.

LETTER

FROM

THE SECRETARY OF THE NAVY,

RESPECTING

The Floating Dock at Brooklyn.

December 22, 1842.

Referred to the Committee on Naval Affairs.

Navy Department, *December* 20, 1842.

Sir: In compliance with the resolution of the House of Representatives of the 17th instant, I have the honor to report:

By the second proviso of the act "making appropriations for the naval service for the year one thousand eight hundred and forty-two," it is enacted "that the Secretary of the Navy may, in his discretion, apply the sum of one hundred thousand dollars of the amount hereby appropriated, and any balance of former appropriations for the construction of a dry dock at Brooklyn, New York, to the construction of a floating dock at the same place; and if any part of this appropriation shall be expended upon the construction of a floating dock, as hereby authorized, the construction of the dry dock shall be suspended until the further order of Congress."

I have given to this law the following construction: As the dry dock is already commenced in the navy yard at Brooklyn, upon land undoubtedly belonging to the United States, the direction that no part of the appropriation shall be applied to that object, with certain exceptions, "until a suitable place shall be selected in the harbor of New York, and the title to the land obtained," &c., is understood to mean that the Secretary of the Navy shall select such suitable place, without reference to what has already been done towards constructing that dock. If the intention had been to limit the selection to the different positions in the yard itself, there would have been no necessity for any provision for obtaining the title to the land; nor would so wide a range have been given as the "harbor of New York," which extends a great distance on two rivers. It is also considered altogether improbable that Congress designed to separate the dry dock from the navy yard; and, consequently, it is to be inferred that if a "suitable place" for the former should be selected out of the limits of the present yard, the whole establishment would be moved to such new locality. . The duty, therefore, which the law devolved on me embraced, according to my understanding of it, the selection of a new site for the navy yard, as well as of one for the dry dock, if it should appear advisable to do so.

Qualifications of a peculiar kind, and such as I certainly do not possess, are necessary for the proper performance of this duty. It is impossible to suppose that Congress designed to devolve so important a task on my unaided judgment. That task seemed to me to require the joint counsels of the navy officer and the civil engineer, and to demand the highest order of qualifications in both of them. I accordingly appointed Captains William B. Shubrick and D. Connor, of the navy, and Moncure Robinson, Esq., (whose reputation as a civil engineer is well known to the country,) to make the necessary examinations, and to report the result to me. The points to which their attention was called will appear from my letter of instructions to them, hereto annexed, (marked No. 1.) They have performed the duty intrusted to them in a highly satisfactory manner, and I now present their report, (marked No. 2.)

It is admitted, on all hands, that the present dimensions of the Brooklyn navy yard are too narrow for such an establishment as ought to be made in so important a port. It became necessary, therefore, to ascertain whether or not the requisite additional land could be obtained, and at what prices. For this purpose I have been favored with the kind assistance of Henry C. Murphy, Esq., of Brooklyn, who gives me assurance that there will be little or no difficulty in obtaining all the additional land which will be required. A copy of his letter (marked No. 3) is herewith presented. It seemed to me that the ability or inability of the Government to enlarge the present yard to the required size would form a controlling consideration in the inquiry whether the yard should or should not be continued where it is. It is gratifying to perceive, both from the letter of Mr. Murphy and the report of the commissioners, that there will probably be no difficulty on that point.

This is not the first time that the policy of continuing the Brooklyn navy yard at its present location has been brought in question before Congress. In December, 1836, the Secretary of the Navy transmitted, in answer to a resolution of the House of Representatives, a report from L. Baldwin, on the comparative advantages of various positions in the neighborhood of New York; and again, on the 29th of March, 1838, the Navy Commissioners made a very full report on the same subject. To these documents, now on the files of the Government, I respectfully refer. They confirm the conclusion to which the commissioners appointed by myself have come, and, it is presumed, render it no longer doubtful that the Brooklyn navy yard ought not to be disturbed.

This fact being assumed, the propriety of constructing the dock, whether walled or floating, *within* the yard, or within its waters, is too manifest to admit of doubt. I have therefore only to express my entire concurrence in the views of the commissioners on this point.

In determining whether the appropriation to the dry dock ought or ought not to be withheld from that use, and applied to the construction of a floating dock, I was conscious of a still stronger necessity for calling to my aid the scientific and practical knowledge of others. Many considerations of a purely technical character enter into that inquiry. The mechanical power necessary to be applied; the strength and durability of the materials used; the effect on the structure of the ship by the pressure applied to her; the security of the ship while in dock—these, and other topics of like kind involved in the general inquiry, demand a variety of information, scientific and practical, which very few men possess. As it seemed to me to be very important that the results obtained should be satisfactory and conclusive, I determined to intrust the matter to a commission, combining all the requisite qualifications for prosecuting a thorough investigation, and forming a correct decision. With this view, Captain B. Kennon, of the navy, Colonel Samuel Humphreys, chief naval constructor, attached to this Department, and Professor Walter R. Johnson, of Philadelphia, were selected. It is believed that a more competent commission, or one combining in higher degree all the knowledge and practical skill required for such a service, could not have been formed.

In order to invite public attention to the subject, and to afford an opportunity for the presentation of all the various plans of floating docks now in use, an advertisement, of which I annex a copy, (No. 4,) was inserted in the public newspapers.

My letter of instructions to the commissioners (No. 5) will show the points to which their attention was directed.

They entered upon their duties at the appointed time, and the result of their labors is now communicated in a copy of their report, (No. 6.)

I can add nothing to the views presented in this report. The wide range of inquiry which it embraces, the scientific calculations and results which it presents, the careful investigation which it displays, and the sound and satisfactory conclusions to which it conducts us, entitle it to great confidence and respect. I am not in possession of any information which would enable me to throw additional light upon the subject.

In applying the information thus obtained to the actual condition of the navy, I do not feel that I should be justified in recommending the construction of any floating dock whatever in the harbor of New York. There is no emergency which demands it. The dry docks of Gosport and Charlestown afford all needful facilities in repairing our vessels of war in time of peace, and would be sufficient, even in time of war, and for a much larger navy than our own, if we could be sure of commanding them at all times. It would not be safe, however, to rely on one or two places only, whatever conveniences and facilities they might afford, since an enemy, superior to us at sea, might effectually exclude us from them. Besides, it is very important that ships needing repairs should be able to obtain them without delay, and without the risk of a voyage to a distant port. A coast so extended as ours ought to present at least five stations, affording the necessary facilities for the speedy and complete repairing of our vessels of war. Of these, there should be one in the Gulf of Mexico, and one on the coast of Georgia. The former will be necessary for the repairs of vessels which it will be indispensable to keep constantly in the Gulf of Mexico, and which could not be sent to any Atlantic port for repairs without great risk and loss of time; the latter will be necessary for a similar reason. No part of our coast is more dangerous than that between Savannah and Norfolk, and none which would more expose a vessel, in a crippled state, to the danger of capture in time of war. Our cruisers to the South would be able to reach, without difficulty, a port in Georgia, when it would be impossible to reach one in the Chesapeake bay, or further North. These two establishments would be sufficient for the southern portion of our country; the middle and northern portion of it would be amply provided for by the present dry docks at Charlestown and Gosport, and *by a similar dock at New York*. The great importance and value of that port, both in a commercial and in a naval point of view, entitles it to a dock of the best kind for the building and repairing of vessels of war. Of the superiority of the walled or dry dock over any and all forms of floating dock, I entertain no doubt whatever. The reasoning of the commissioners upon that point is, in my opinion, perfectly conclusive; and, as I am also of opinion that a better position for a dry dock cannot be found "in the harbor of New York" than that which has already been selected, I shall, unless otherwise directed, proceed with the dry dock at Brooklyn as rapidly as the means at my disposal will allow. I respectfully suggest, however, that a more favorable opportunity than the present, of obtaining the requisite land for enlarging the Brooklyn navy yard will, probably, not soon occur. The importance, and indeed the absolute necessity, of this enlargement no longer admits of doubt.

Although the excavated or walled dock is, in my opinion, the only one on which we can safely rely as a permanent establishment, yet it cannot be doubted that the floating dock may be very advantageously used as an auxiliary. I cannot recommend it as a *substitute* at any place which admits of the construction of a walled dock at reasonable cost, and it is at least doubtful whether it would answer for any vessel of a larger class than a sloop of war. In consequence of the shallowness of the harbors throughout the Gulf of Mexico, the vessels destined to cruise there and in the Caribbean sea will necessarily be of small size and light draught. For the repairs of such vessels, a floating dock would afford all needful facilities. There is not, therefore, any necessity for the construction of a walled dock on the Gulf of Mexico, nor will there be at any time during the continuance of peace. If it should hereafter be deemed necessary to make provision for a different state of things, the delay which the convenience of the Treasury may require will occasion no inconvenience to the navy, if a floating dock should be provided of sufficient power to take up a sloop of war. The cost of such a dock would be very inconsiderable, and, if properly constructed and properly taken care of, it would last twenty years. Such a dock, built at Pensacola, would be of great value in the arrangements of this Department. It is of great importance that our vessels of war should be frequently seen in the ports of the Gulf of Mexico; and, to effect this, a certain portion of them should be kept at all times in that Gulf. The necessity which they are now under of making a long, tedious, and dangerous run to Norfolk or Boston, whenever the most trifling repairs to their bottoms are necessary, renders it almost impossible to keep them in the Gulf of Mexico for any length of time. Hence the interests of our commerce in that Gulf cannot receive from the navy the attention which they require. A small appropriation would enable the Department to provide, in the course of the ensuing summer, the necessary means of repairing all vessels which it will be necessary to keep on that station, and consequently to afford at all times whatever protection or assistance our commerce may need from our naval power.

It is a task of some difficulty to decide between the several plans of floating docks which have been presented. The commissioners give the preference to that of Mr. Gilbert. In point of power and effectiveness, it is not superior, and perhaps not equal, to the section dock offered by Mr.

Dakin. Its great recommendations are its comparative cheapness, the simplicity of its construction, and the comparatively small depth of water which it requires. This last is a controlling consideration. There is reason to fear that the section dock of Mr. Dakin, of sufficient size and power to take up a sloop of war, could not perform its function in the harbor of Pensacola. It has been suggested to me, however, that the floats of his dock may be so constructed as to require a much less depth of water than those which were exhibited to the commissioners; and, if so, a very formidable objection to his plan will be removed. I have no doubt that either of these two docks would answer every purpose, and I have very little preference for the one over the other. In addition to the testimonials herewith submitted, there are many others, of a strong character, in favor of both the plans now on the files of the Department. These will be furnished, if it should be the pleasure of Congress to call for them. They are not now sent, only because other and more pressing engagements now occupy the clerks of the Department, so that copies could not be conveniently taken in time for this report.

The Pennsylvania, the largest ship in our navy, is three thousand two hundred and forty-one tons. A dock, therefore, with a lifting power of three thousand five hundred tons, would be sufficient for any purpose to which it would ever be desirable to apply it. To take a ship of war into a dock of any sort, with her armament on board, would be extremely hazardous, and, it is presumed, would never be attempted. It is unnecessary, therefore, to construct a dock with reference to such a purpose.

In conclusion, I respectfully recommend—

1. That an appropriation be made for the purchase of such lands as may be necessary for the proper enlargement of the navy yard at Brooklyn.

2. That an appropriation be made for the construction of a floating dock at Pensacola, of sufficient size and power to take up a sloop of war of the first class.

Respectfully submitted.

A. P. UPSHUR.

Hon. JOHN WHITE,
Speaker of the House of Representatives.

No. 1.

NAVY DEPARTMENT, *August* 12, 1842.

GENTLEMEN: By the act of Congress making appropriations for the naval service for the year 1842, it is provided: "That no part of this or any former appropriation to that object shall be applied to the construction of a dry dock at Brooklyn, except in payment for materials previously contracted for and yet to be delivered, until a suitable place shall be selected in the harbor of New York, and the title to the land obtained, and a plan and estimate of the cost made, under the direction of the Secretary of the Navy, and approved by him and the President."

This proviso seems to contemplate that no further proceedings shall be had in the construction of the dry dock at Brooklyn, until Congress shall have the means of determining whether or not a more suitable place can be obtained within the harbor of New York. It may also involve the removal of the *navy yard.* It is necessary, therefore, that the Department should be informed fully on every point connected with both these views of the subject. You are hereby appointed commissioners to obtain this information, and, in the discharge of that duty, you will please embrace the following objects:

1st. You will ascertain and report whether there is or is not, within the harbor of New York, a position more favorable for a navy yard than that at Brooklyn, designating the place, with a full detail of all the reasons which induce you to prefer it. You will also ascertain whether or not the land can be obtained, and at what price; and, if it can be obtained, you will also present a plan of the yard, and an estimate of the cost. Should such selection be made, you will also present, in connexion therewith, an estimate of the value of the lands now occupied as a navy yard at Brooklyn, should the same be put to sale, and of such other property therein as could not be advantageously removed to another position.

2d. If you should be of opinion that there is not, within the harbor of New York, a more suitable place for a *navy yard* than the present one, you will then ascertain whether or not there is a more suitable place therein for a dry dock; and, if you determine that there is, you will in like manner ascertain whether or not the land can be obtained, and at what price; and you will present also an estimate of the cost of a dry dock at such place. You will, in this case also, state at large the reasons which govern your decision.

In calling your attention specifically to the above objects, it is not my intention to limit the range of your inquiries, nor to prescribe the topics to which your report shall be confined. You will perceive that the object is to obtain full information on every point necessary to decide the judgment of Congress on the question whether the navy yard or the dry dock ought or ought not to be removed from its present position to any other position within the harbor of New York. The *means* of obtaining this information are left to yourselves. You will consider as "within the harbor of New York" every place within the State of New York sufficiently near to the city to afford all the conveniences and facilities which such an establishment can be supposed to derive from the neighborhood of a large town.

In the comparison which it will be necessary to institute between Brooklyn and other places, you will have reference to the present size of the navy yard, and to the necessity which may exist of enlarging its limits. You will of course ascertain whether or not such enlargement is practicable, and what will be the cost of the ground required to be purchased.

I am, respectfully, &c.

A. P. UPSHUR.

Captain D. Connor,
Captain W. B. Shubrick,
Moncure Robinson, Esq.

No. 2.

Washington, *October* 27, 1842.

Sir: The undersigned, commissioners appointed by you, under your communication of the 12th of August, "to ascertain and report whether there is or is not, within the harbor of New York, a position more favorable for a navy yard than that at Brooklyn; and in case they should be of opinion that there is not within the harbor of New York a more suitable place for a *navy yard* than the present one, then to ascertain whether there is a more suitable place for a dry dock," have the honor to report:

That, in their investigations on this subject, they have, agreeably to your instructions, considered "as within the harbor of New York every place within the State of New York sufficiently near to the city to afford all the conveniences and facilities which such an establishment can be supposed to derive from the neighborhood of a large town;" and have also, with a view of fulfilling as fully as practicable the objects of their appointment, embraced in their investigations some other points which, though *not in the State of New York*, were on waters adjacent to the city, and which, therefore, they supposed you would wish considered, with a view to the determination of the question, "whether the navy yard or the dry dock ought or ought not to be removed."

The result of this extended examination has been a conviction in the minds of each of the undersigned that no spot which could be obtained by the Government, on any of the waters adjacent to the city of New York, combines, in an equal degree, advantages for a naval establishment, with the present navy yard.

The commissioners have been brought to this conclusion by the following considerations:

The points of most essential importance in the selection of a site for a navy yard appear to them to be the following:

1. An adequate depth of water at the wharves for vessels of war of the largest class.
2. Facility of ingress and egress.
3. Safety.
4. Adequate space for all necessary constructions.
5. Convenience in obtaining workmen, seamen, materials, and supplies.

It appeared, on an examination of the *bay* of New York, that its shores, with the exception of about two miles, immediately above the fortifications at the Narrows, were precluded from considerations by their shoalness. Within this distance of the Narrows there is good water on both the Long Island and Staten Island shores; but the exposure to floating ice and winds, and to attack from an enemy which might effect a landing on either shore, below the fortifications at the Narrows, and, by a sudden incursion, destroy the building and shipping at the yard, unless a separate force was kept for its defence, unavailable for that of the city, or even of the fortifications, seem to be insuperable objections to a site on this portion of the bay.

Similar objections would apply to a site on the East river, whether on the main land or on Long Island, between the fortifications at Throg's point and Hellgate. The coves and inlets in this distance are very shoal, and it is not believed that a spot could be found presenting very decided advantages for a navy yard. But a serious obstacle to any site in this distance, could one be procured, would be the necessity of providing for its defence by a separate force from that which might be organized for the defence of the city of New York and the towns of Brooklyn and Williamsburg. Added to this objection would be the want of the facilities and conveniences for building and equipment which a site nearer to

New York would present, and the consideration that the naval force which might happen to be at a navy yard so located, which might be blockaded by an enemy's fleet in the sound, could not be made use of, without encountering the pass at Hellgate, for the defence of the city and shipping, in the event of a threatened attack. These considerations made it, in the opinion of the undersigned, unnecessary to make the same minute examinations of every portion of the shore in this distance which was made by them at other points.

Any site on the Hudson, above Hoboken point, seemed to them out of the question, in consequence of the difficulties and dangers to which ships might be subjected, in approaching or leaving it, from floating ice in the winter or spring. Above that point the ice, which below it is, on its breaking up, usually accumulated on the east shore of the Hudson, leaving the west comparatively free, is carried successively by the tides and currents from the one to the other shore, often in large masses, and making a passage up or down the river for any vessel, not sheathed with iron and driven by steam, extremely dangerous, if not impracticable.

There appeared, then, to be controlling obstacles in the way of the adoption of any site on either shore of the bay of New York—of the East river beyond Hellgate, and the Hudson above Hoboken—and that any eligible site for a navy yard, in waters adjacent to New York, must be found either on the shores of the East river, between Governor's island and Hellgate; on the western shore of the Hudson, below Hoboken point; at one of the islands in the bay; or in the Kills, separating Staten island from the Jersey shore.

The commissioners have made an examination of every available point within this more limited range, but deem it unnecessary to lengthen this report by enumerating objections to sites found on such examination to present no circumstance in their favor, and will therefore confine themselves to the consideration of those which seemed in one or more respects worthy of comparison with the present navy yard. But three sites within this range of examination seemed to them entitled to such comparison. These were the northwestern shore of Great Barn island, Governor's island, and the western shore of the Hudson, immediately below Hoboken point.

Comparing the first of the above-named sites with the Brooklyn navy yard, there seems to be in its favor the facility of obtaining, probably at a fair rate, whatever ground might be required for the purposes of a navy yard, and a sufficient depth of water. But all the other points, above enumerated as of essential importance in the selection of a site, would be in favor of the present yard.

In facility of ingress and egress, it would not compare with the Brooklyn navy yard, both because it is more remote from the sea by way of Sandy Hook, and because it would not answer to approach or leave it with light and variable winds, which might fail or change—in which case there would be danger of a vessel being drawn into the currents setting through Hellgate, and thrown upon some of the rocks or reefs so designated.

In safety, the advantages would also preponderate in favor of Brooklyn, both as regards natural causes and an enemy. The anchorage is bad, both in approaching and on much of the bottom near Great Barn island; and there would be danger of vessels, unless well up in the channel between the island and the main land, being drawn from their moorings by the strong currents which often set from the shores of the island upon Hellgate. The breaking of a cable, in such a situation, would be attended with great hazard. As regards attack from an enemy, whilst the risk would not be serious, a navy yard at Great Barn island labors under this disadvantage, in comparison with one at Brooklyn: that the latter is necessarily protected by the troops and defences which would be provided for the defence of New York, whilst it would be necessary to modify these with reference to the protection of the navy yard, weré one established at Great Barn island.

The navy yard at Brooklyn would also be obviously much more conveniently situated for obtaining workmen, seamen, materials, and supplies of every description; and would possess the further advantage over a yard at Great Barn island, that, if it were deemed advisable to employ the naval force at the station in combination with the other defences of the harbor, there would be a better guaranty of its being at every moment in the most effective position, from the greater contiguity of the yard.

In a comparison of Governor's island with the present navy yard at Brooklyn, there seems to be a near approach to equality of advantages, as regards depth of water, convenience of access, space for necessary construction, and supplies of all kinds; though in one respect the present navy yard has an important advantage over a navy yard at Governor's island—that of being situated in a cove, where men of war, lying at anchor or moored, would be out of the way of vessels passing in and out of the harbor of New York, or to and from the sound.

In safety, Governor's island would in one aspect have an advantage in its insular position, which would exempt it more completely than the yard at Brooklyn could be from the attempts of incendiaries; but, on the other hand, the appropriation of Governor's island to the purposes of a navy yard, instead of a fortification, (if, indeed, such an appropriation is authorized by the terms of its grant to the Government,) would, in the opinion of the commissioners, subject not only the yard itself, but the city and shipping of New York, to greatly increased danger. They express their opinion with some diffidence, because they are aware that it has been thought by able engineers that the works executed and proposed by the Government, at the Narrows, would guaranty the harbor of New York from attempts by a hostile naval force, however powerful. It seems to them, however, that a bold commander might well, without incurring the reproach of rashness, make the attempt to pass the works at the Narrows, even though much stronger than they are, with the knowledge that when passed there was no obstacle in the way of his reaching New York and destroying the public and private shipping, and putting the city under contribution, when he would long hesitate if he had afterwards to expose himself to the cross-fires of Governor's and Bedloe's islands; and that, at all events, the great interests concentrated at New York ought not to be exposed to the contingency of the works at the Narrows being silenced, or surrendered by force or through treachery, slight as such hazard might be. If these views be correct, and an inner line of defence be advisable, the position of Governor's island is invaluable for this purpose; and, waiving other considerations, the extent of the island, (about 88 acres only,) being not more than adequate to an extensive navy yard, would be insufficient for this purpose and a strong fortification.

To make use of the western shore of the Hudson, immediately below

Hoboken point, it would be necessary, in order to break the force of the current, to throw a jettee down stream from this point, at an angle of about 30 degrees with the shore. Such a jettee would probably be objected to, on account of its tendency to throw the current more towards the eastern shore than at present, and to increase the accumulation of ice, during winter, against the wharves on the New York side of the river; but, by means of it, men of war might, at most periods of the year, and except under particular circumstances, have safe access to a navy yard placed on the western shore of the Hudson, between Hoboken point and a village of that name. With such a jettee, the following comparison would hold between a navy yard at this site and the present navy yard at Brooklyn:

1. As to depth of water, each site would present nearly equal advantages; the site at Hoboken requiring only moderate wharves to obtain any requisite depth, whilst at the Brooklyn navy yard the depth of water is already ample, though some expenditure in walling and dredging will be requisite, to attain a sufficient width of adequate depth.

2. As to facility of ingress and egress, the case is also nearly a balanced one, but is probably somewhat in favor of the present navy yard, as, when the Hudson is very full of floating ice, with easterly or northeasterly winds, vessels would be unable with entire safety to enter or leave a navy yard at Hoboken.

3. As to safety, a navy yard at Hoboken would be more out of the way of attack and in no danger of surprise by an enemy, which might land unexpectedly, merely with a view to the destruction of the yard, looking to an immediate retreat to its ships. But, in this respect, the danger to the navy yard at Brooklyn, with the large population of Brooklyn and Williamsburg, and its contiguity to New York, seems to be but slight; and, as before observed, the circumstance that the necessary defences of New York against a regular attack equally defend Brooklyn and the navy yard seems to place the present site on as advantageous ground, or nearly so, in regard to safety, as any other.

4. As to space for necessary construction, ground suitable to this purpose at Hoboken would be of limited extent; and in this respect the present location of the yard, even without any further extension of it, would be most advantageous.

5. As to convenience in obtaining workmen, seamen, materials, and supplies. In this respect, Hoboken would be favorably situated, but not as much so as the present yard, which, being on the East river, the centre of the trade of New York and Brooklyn, on which most of the private ship yards are situated, and having all the facilities afforded by both towns, would be more favorably situated than any other point.

It will appear, from the above comparison of sites, that if the question was an original one, the balance of advantage would be in favor of the present navy yard at Brooklyn. The large expenditures which have been incurred by the Government at this place furnish, of course, under existing circumstances, a strong additional consideration in its behalf, which, with those above presented, seems to the commissioners conclusive in favor of the present site.

In making the above comparisons, the undersigned have not been unmindful of your instructions to have reference to the present size of the navy yard, and to the necessity which may hereafter exist of increasing its limits. There can be little doubt that such necessity will exist at a point which will probably always prove the most advantageous for the rapid construction, repairs, and equipment of our ships of war.

The commissioners are informed that there will be no difficulty in the Department's procuring, at fair rates, such additional property as it may deem advisable to purchase adjacent to the present navy yard, whether with a view to its future extension, or to its better protection against fire. With reference to the last-named object, it would probably be expedient to purchase, if to be had at fair rates, the lots adjoining the northwestern boundary of the yard as far as Little street, and, with a view to the future extension of the yard, if to be had on similar terms, it would be desirable to procure the margin of Wallabout bay, between the southern angle of the yard and the hospital grounds. Should the Government be unable to obtain this increase of space at fair prices, it will be attended with no very serious expense to provide, within the present limits of the yard, the increased accommodation which may be required.

The commissioners would advise, even without reference to such extension of the yard, the construction of a quay wall parallel, or nearly so, to the present wharves of the yard, and about three hundred feet from them, with a view to an increased water way of adequate depth. Such a work seems to them an indispensable preliminary to the attainment of the object, as, without it, a passage for ships to lie in, of greater width than that hitherto kept open by the tide, could not be maintained, without great and constant expense in dredging, resulting, from the wash at each ebb and flow of the tide, from the mud flats in the centre of the Wallabout. Should such a quay wall be constructed, the flats beyond it would rapidly fill up in the more perfect eddy which would thereby be created, and the operation might be hastened, by depositing in the flats beyond the wall all future excavations from the yard. The necessary space, for the future wants of the Government, would probably be obtained in this way as early as it might be wanted, should it not be found practicable, at a moderate cost, to make the extensions of the yard which have been suggested.

The undersigned have now the honor to respond to that part of their commission by which they are required, in case they "should be of the opinion that there is not within the harbor of New York a more suitable place for a navy yard than the present one," then "to ascertain whether there is a more suitable place for a dry dock."

The case is undoubtedly not a very favorable one for founding a dry dock at the present navy yard, and probably there are many other positions in the harbor where such a work might be constructed at less expense. But the difficulties to be encountered are not greater than have often been overcome in founding other works requiring similar precautions; and it appears to the undersigned that there is nothing in them to justify placing elsewhere a structure so essential to the completeness of the yard, and the use of which, at even a short distance from it, would be attended with so much inconvenience. They concur, in this respect, entirely in opinion with a distinguished engineer, (the late Colonel Baldwin,) for some time in the service of the department, who, in a report dated July 11, 1835, on the subject of constructing a dry dock at the Brooklyn navy yard, or at Governor's island, observes: "The construction of a dock only at the island seems so objectionable, and the objections are so strong against its being placed any where, in separate ground, without the enclosure, that a moment's reflection upon the inconvenience, increased expense, and delays attending its use, will dissipate all thoughts of such an arrangement.

"The dry dock is, in fact, a necessary workshop, where the whole ship is taken in at once, and where every kind of workmanship, and all branches of mechanic labor incident to the repairs, refitting, or rigging a vessel from the keel to the main truck, may be carried on at the same moment, and even the armament, watering, and provisioning, be going on in the mean time.

"A dry dock is therefore a necessary appendage to the yard; it should be near to and easily accessible from every workship, office, store, and warehouse of the establishment. In this view, we consider a separation of a dry dock from the other parts of a complete and well-ordered dock yard as inadmissible."

For the elucidation of this report, the undersigned beg leave to refer to the published maps of the harbor of New York, and to the maps, in the department, of Great Barn island and the adjacent waters, and of the present navy yard at Brooklyn.

All of which is respectfully submitted.

W. BRANFORD SHUBRICK.
D. CONNOR.
MONCURE ROBINSON.

To the SECRETARY OF THE NAVY.

No. 3.

BROOKLYN, *October* 15, 1842.

SIR: Enclosed you will find the agreement in relation to the land between the navy yard and the hospital grounds at this city. It is signed by all the parties owning land there who are adults. In relation to the infants, the letter of Judge Morse, their legal adviser, which is also enclosed, will show the position in which they stand. They have deemed it unnecessary to make application to the chancellor until the proposition shall be accepted, as it would be attended with expense.

It was intended to have the agreement re-engrossed and re-signed, but, as it would be attended with some delay to see all the parties again, it is forwarded to you as it is.

Hoping that such speedy course will be pursued and measures taken as will secure the object which I have in view for the city of Brooklyn,

I remain yours, truly,

HEN. C. MURPHY.

Hon. A. P. UPSHUR,
Secretary of the Navy.

BROOKLYN, *October* 3, 1842.

DEAR SIR: I have seen Mrs. Margaret Ryerson on the subject of the proposed offer of ground below Flushing avenue, in the Wallabout, to the United States. She is prepared to make an application to the chancellor for leave to join in such sale in behalf of her children, (they being under age,) if the Government receive the proposition favorably. You may confidently rely upon Mrs. Ryerson and her children joining you in the proposed sale, if the same shall take place. I saw General Johnson and Alderman Johnson, his son, who are the advisers of Mrs. Spader, and they informed me she would make the requisite application to chancery in behalf of her children, and cordially join in the sale, if one should be effected.

In haste, yours, truly,

N. B. MORSE.

William P. Wells, Esq.

Know all men by these presents, that we, the undersigned, owners of land fronting on the Wallabout bay, between the United States navy yard and the naval hospital ground, and lying north of Flushing avenue, in the seventh ward of the city of Brooklyn, in the county of Kings, and State of New York, for and in consideration of the sum of one dollar, to each of us in hand paid, the receipt whereof is hereby acknowledged, do hereby—each for himself, his heirs, executors, and administrators—covenant, promise, and agree, to and with Hon. A. P. Upshur, Secretary of the Navy of the United States, and his successors in office, to convey to the United States of America, or their authorized agent, by a good and sufficient conveyance in the law, free and clear from all incumbrances whatsoever, all our and each of our lots, pieces, or parcels of land, lying north of Flushing avenue, in said city, and fronting on the Wallabout bay, between the United States navy yard and the naval hospital grounds, as aforesaid, together with all and singular our and each of our respective right, title, and interest, of, in, and to the said lots, pieces, or parcels of land, and the land covered by water, in front thereof, in the Wallabout bay aforesaid, and our and each of our respective rights, privileges, and easements, benefits and advantages, which belong or in anywise appertain to the said premises, and to the said Wallabout bay, or the waters thereof, or to us respectively, as the owners thereof, upon the receipt of such sum and sums of money by us, respectively, as may be fixed, determined, and agreed upon by three impartial and discreet persons, to be chosen, two of them, one each by the parties interested, the third, by the two thus chosen for that purpose, from the inhabitants of the city of Brooklyn, within six months from and after the date of these presents, and to be sworn well and truly, and impartially to appraise the just value of said lands and premises belonging to each of us, respectively, (a proper sewer or sewers for the waters south of Flushing avenue being reserved over said lands.)

In witness whereof, we have hereunto set our hands and seals, this twelfth day of October, one thousand eight hundred and forty-two.

Sealed and delivered in the presence of

WILLIAM P. WELLS,
ROBERT S. MANLIE,
PETER McCARTY,
WM. H. CARY,
JOHN H. BAKER,
SAMUEL BOUTON,
WM. HUNTER, Jr.,
H. L. CLARKE,
L. V. NOSTRAND,
J. S. MACKAY,
THOS. S. McCARTY,
THE HEIRS OF COM. CHAUNCEY.

In explanation of the above, "heirs of Com. Chauncey," being written in the informal manner that it is, I would state that the Rev. Mr. Chauncey, the Commodore's son, met me at the steamboat landing, this morning, at Port Chester, and, understanding that a copy of this paper, with seals attached, was to be submitted to the Government, he made the entry to signify his approbation of the measure.

J. S. MACKAY.

BROOKLYN, *October* 10, 1842.

No. 4.

FLOATING DOCKS.

NAVY DEPARTMENT, *August* 9, 1842.

By the act of Congress making appropriations for the naval service for the year 1842, it is provided "that the Secretary of the Navy may, in his discretion, apply the sum of one hundred thousand dollars of the amount hereby appropriated, and any balance of former appropriations for the construction of a dry dock at Brooklyn, New York, to the construction of a floating dock at the same place; and if any part of this appropriation shall be expended upon the construction of a floating dock, as hereby authorized, the construction of the dry dock shall be suspended until the further order of Congress."

In order to carry out this purpose, I invite proposals for the construction of a floating dock at New York. The proposals must be accompanied by—

1st. An exact description of the dock, with all its machinery, and also a working model thereof.

2d. A specification of the kind of timber out of which its several parts shall be built.

3d. The prices of docks of three different sizes—the first for ships of the line, the second for frigates of the first class, and the third for sloops of war and smaller vessels.

4th. The draught of water, when light, of a dock of each of the above-mentioned sizes.

5th. The length of time and number of hands required to take up a vessel, and to prepare her for receiving repairs.

Every part of the dock exposed to the action of salt water must be covered with twenty-four ounce copper.

Those who have floating docks already constructed will be expected to exhibit their powers and mode of operating upon a vessel of suitable size, which the Department will furnish.

Proposals must be made by the first day of September.

A. P. UPSHUR.

No. 5.

NAVY DEPARTMENT, *September* 10, 1842.

GENTLEMEN: By the act of Congress making appropriations for the naval service for the year 1842, it is provided "that the Secretary of the

Navy may, in his discretion, apply the sum of one hundred thousand dollars of the amount hereby appropriated, and any balance of former appropriations for the construction of a dry dock at Brooklyn, New York, to the construction of a floating dock at the same place; and if any part of this appropriation shall be expended upon the construction of a floating dock, as hereby authorized, the construction of the dry dock shall be suspended until the further order of Congress."

In order to carry out the purposes of Congress, as expressed in this proviso, I have advertised for proposals for constructing floating docks of different sizes. I refer you to the enclosed copy of my advertisement, as explanatory of my objects and wishes. Many proposals have already been made, and it becomes necessary to institute such a comparison between the several plans as will enable me to form a satisfactory judgment in regard to them. You are appointed commissioners for that purpose; and I have designated the 26th of this month as the time at which the examination will commence in the harbor of New York. Your examinations will embrace the following principal objects: First, the advantages and disadvantages of *any* floating dock, compared with those of an excavated or walled dock; second, the comparative merits of the several plans of floating docks, which may be submitted. The scientific and practical skill and information which you bring to the inquiry will enable you to determine much better than I can to what points your attention shall be directed, so that no particular instructions from me are necessary. It is enough for me to say that I wish you to consider the subject in all its bearings, and to make your report as full, and at the same time as minute and particular, as possible.

You may possibly come to the conclusion that a floating dock may be used advantageously *as auxiliary* to an excavated dock in New York, or that it may be *substituted* for an excavated dock at Pensacola, or other places. If so, you will please report your opinion upon that point. Indeed, as it is the object of the Department to ascertain the utility of the floating dock for the purposes of the navy, under all the circumstances in which it can be brought into use, you will be pleased to report any and all facts calculated to influence the judgment, as to the propriety of constructing such docks.

The several persons who have offered proposals will be informed that you will be in New York on the 26th instant, and that you will then be ready to proceed with the necessary examinations.

Should you require to see any of the floating docks in actual operation, Captain Perry will be directed to furnish suitable vessels for that purpose.

I am respectfully, yours,

A. P. UPSHUR.

Capt. B. Kennon,
Samuel Humphreys, Esq.
Professor W. R. Johnson.

No. 6.

Report of the commissioners appointed by the Secretary of the Navy to examine the several plans of floating docks submitted to the Department.

New York, *October* 8, 1842.

Sir: The undersigned, commissioners appointed by you to examine and report upon the several plans of floating docks submitted to the consideration of the Department, beg leave to offer the following as the result of their labors:

At the time designated for meeting the persons who had offered proposals, they repaired to this city, and having, by public notice, acquainted the parties interested with the time and place of their meeting, proceeded to examine the several plans which were offered for their inspection.

In order to render intelligible what they are about to state in reference to the construction and use of docks, it is deemed not inappropriate to refer to some other methods in general use of placing vessels in a convenient situation for undergoing repairs.

Besides the well-known method of "heaving out," by bringing the vessel nearly on her beam ends, and thus reaching the keel, the rise and fall of tides afford in some situations sufficient difference between high and low water to bring even large ships on temporary ways at high tide, where they may undergo moderate repairs during the hours of low water.

In similar situations a dock may be formed, to be opened and closed by gates—the vessel passing in and taking her place at high water, the water receding, and leaving her on proper supports when the tide is out, and the gates being closed to prevent the entrance of the next tide, and so remaining until the repairs are completed. By opening the gates, she may then be allowed to pass out on the first flood tide after the work is finished.

In a similar manner, instead of erecting a strong permanent dock, a simple machine, much in the form of a scow, with one end opening and closing like a gate, has sometimes been constructed. At low water, this is allowed to remain at rest in such a situation that, by leaving the gate open, the succeeding high tide will fill it; after which a vessel may be towed into it, and left over suitable supports, till the tide retires, when she will be found completely exposed for inspection and repairs. By closing the gates, the next tide will be excluded, and the scow set afloat. The two preceding experiments are of course so much dependant on locality as to height of tides as to be seldom resorted to along our Atlantic coast.

When naval architecture had reached a considerable degree of perfection, the maritime nations of Europe learned the importance of secure situations in which to make, at leisure, the repairs demanded by the largest class of ships. The first dock erected at Plymouth (England) was in 1655. It was excavated and walled on the plan still uniformly adhered to among the maritime nations of Europe. At Venice, for centuries past, docks have been employed for preserving ships of war until wanted for service. They were often roofed over, as well as the slips on which the vessels were built. It is stated that more than fifty docks and slips are found in that city.

In the north of Europe, also, for seventy or eighty years past, many roofed docks have been used for laying up ships not in commission, as well as for building and repairing them.

The use of *docks* at the great naval stations in England has given to those important establishments their distinctive appellation of *dock yards*, as the *want* of docks has, till within a few years, rendered the same denomination altogether inapplicable to the navy yards of the United States.

The terms *dry* and *wet* docks have grown into use in the great commercial ports of England, where the latter are employed for enclosing a large body of water, capable of floating many vessels, and of preserving, by means of gates, a uniform level of water within. This avoids the danger of getting aground at low tide, and also secures the convenience of loading and unloading at the same level, subject only to a difference from the variable quantity of cargo on board.

The *dry* dock, chiefly confined to repairing vessels, is a structure of much more limited extent, and is so situated as to permit the largest ships which it is intended to receive to enter, if not at all hours, at least at every high tide. If situated in a port where the tide rises and falls to the amount of the depth of the dock, so that the latter will become empty at the time of low water, it is evident that no artificial means can be necessary to free it from water when the tide retires. Being suitably supported and shored as the water leaves her, and the gates subsequently closed, the vessel remains for any desired length of time without further trouble; but, if the tide have but a limited range of movement, as at most of the American navy yards, it becomes necessary to exhaust the greater part of the water by artificial means. In constructing the dock, also, the chief part of the work lies far below the level of low water; and hence the necessity of a coffer dam, to keep out the water while such docks are in progress.

The greatest depth of water required in a dry dock is about twenty-seven feet. When relieved of this, should the water without gain admission beneath the bottom, and there exert its pressure, the force tending to burst or lift the bottom upwards would be more than seventeen hundred pounds per square foot. Hence there must be either an exclusion of the water from the under side of the dock, so as to take off the hydrostatic pressure in that direction, or the bottom must be constructed of materials so dense, and of such thickness, that the weight from the *foundation* to the upper surface of the bottom shall be equal to that of a column of water from the same foundation to the top of the highest tides. If the bottom be formed of the heaviest granite, of which the specific gravity is nearly three, a thickness of about ten feet might answer this condition, especially as the cement possesses strength enough to unite the bottom to the side walls, and diminish the chance of forcing up the former. If only the weight were available, the thickness must be more than thirteen feet. To sustain the side walls and the closed end of such a dock, which must be nearly or quite forty feet in height, a foundation of the most durable kind must be obtained. In some cases, this has been effected by excavating the dock in part out of solid rock; but, in others, it could only be done by driving numerous piles, and covering their heads with large beams, crossing these with others, then covering the latter with plank, and laying the stone work on this foundation of massive timber. This is one cause of the great expensiveness of an excavated and walled dry dock in such situations as that of the Brooklyn navy yard. It is among the causes why the mercantile marine has sought for other and less expensive means for accomplishing its object. But, besides its expensiveness, there are situations where the permanent walled dry dock would be almost useless, from the variableness of height of water from season to season of the year. This would be peculiarly true of the great rivers of the West. A dry dock at Pittsburg, Cincinnati, Louisville, or St. Louis, must, in order to be available at *all* seasons, be at least three or four times as deep as would be necessary to float the ordinary river-craft of the Ohio and Mississippi.

In order to secure despatch in docking and relaunching the steamboats of that part of the country, a floating apparatus, or something equivalent to it, which can adapt its operations to the variable height of the river, is indispensable.

It was, no doubt, the same expensiveness of the excavated dry dock which induced commercial men to employ all the various substitutes which have of late years been so extensively adopted—such as the marine railway, the screw dock, and the hydraulic lifting dock, together with the several forms of floating dock hereafter to be described. All these have been witnessed by the commissioners, and the manner in which commerce avails herself of their aid has been attentively studied. They illustrate, at once, the unbounded resources of the mechanic arts, and the fertile ingenuity of our countrymen, with whom many of these methods of raising ships have originated.

They may all be most advantageously contrasted with the clumsy expedient resorted to at the Plymouth dock yard in 1817, when the 78-gun ship, the Kent, after being completely dismantled, and placed upon sliding planks, was hauled up, against the enormous resistance of friction, upon the ways of a common building slip, by means of 14 capstans, each acting on a threefold purchase, and worked by 2,116 men.

Even this awkward device would, if applied at this time, and in this country, be vastly improved in character, by substituting anti-attrition metals for bare or merely greased surfaces of timber on the planks and ways.

Theoretically considered, it must be evident to any one acquainted with the simplest elements of mechanics, that either of the principles on which these substitutes are founded is as capable of being extended to a line-of-battle ship as to a merchant ship of 500 or 1,000 tons burden.

By increasing the number of tracks, and securing the solidity of each with corresponding strength in the cradles and trucks of a marine railway; by augmenting the number, diameter, and length of the screws in a common lifting screw dock; by enlarging the size and strength of the cylinder and plunger of the hydraulic elevator in that kind of dock; or by adding to the capacity of the caissons or tanks of the floating docks, it is undeniably true that power enough may be given to either of these forms of apparatus to accomplish the entire elevation of the heaviest structure that ever floated on the ocean, and not the dismantled structure only, but fully equipped, with all her masts, rigging, crew, stores, and armament on board.

The practicability of such an operation was many years since recognised in an English publication* of high authority, in which we find the following brief description of a wrought-iron moveable caisson, with a rudder, for docking a ship while riding at her moorings, in any depth of water, leaving her keel dry in three hours, without removing her stores or masts:

* Falconer's Marine Dictionary, edition of 1815.

"This caisson, or floating dock, is made of wrought iron, half an inch thick, 220 feet long, 64 feet wide, and 30 feet deep, and will weigh about 400 tons, with a stage of 6 feet wide on the top for the workmen to stand on, and also to strengthen the caisson. The weight of this caisson, when immersed in water, is nearly 350 tons, but, for reasons mentioned below, it is rendered nearly buoyant, being surrounded by an air receptacle capable of suspending the whole weight with great exactness, and which is rivetted to it in such a manner as also to strengthen the caisson and support the principal shores from the ship.

"While light, this caisson will draw nine feet water. When taken to the ship intended to be docked, the water is to be let in at an opening or plug hole in the bottom, and it is to be suffered to sink until the upper part is even with the surface of the water—the air tube still keeping it buoyant.

"A small quantity of air is then to be discharged by opening a plug hole in the air receptacle, until a quantity of water is let in just sufficient to sink the caisson below the ship's bottom. This being effected, the caisson (nearly buoyant) is then to be raised to the surface of the water by ropes made fast from the caisson to each quarter of the ship. A pump, placed within the caisson, is then to be worked by a steam engine of twelve-horse power, placed in a barge alongside, which will empty it in three hours, and reduce the draught eight feet water—that is, from twenty-six to eighteen feet, when she may be carried up into shoal water, if required, or along side wharves, or jettee heads of the dock yards. The ship's sides and bottom tending to fall outwards by their own weight, and the sides and bottom of the caisson tending to be forced upwards by the external pressure of the water, it is obvious that, by placing props or shores between, both will be supported, while the ship will ride with all her stores on board and masts standing, nearly as easy as when in water. Should inconvenience be apprehended, at any time, from blowing weather, the caisson may be cast off and let fall to the bottom, where it cannot be injured, and whence it may be raised to the ship's bottom again at pleasure, with as little labor as weighing an anchor. The caisson will be twelve feet above water, when there is a first-rate ship in it. This is a sufficient height to prevent the sea from breaking over. By this plan, a ship may have her bottom examined, and be let out again in six hours.

"From estimation, it has been ascertained that a caisson capable of docking a first-rate ship will not cost above £20,000, and, judging from the duration of wrought iron in salt pans, will last twenty years without repairs."

In none of the floating docks, either proposed or constructed in this country, do we find any thing more simple or more certain in its action than would have been this proposed iron caisson. But a very serious objection to its use, in the *form proposed*, is the fact that it could be brought under or cast off from the ship only where there was more than double the depth of water which the ship drew. In the case above supposed, of a ship drawing twenty-six feet water, and a caisson thirty feet high, the depth of water where it must be put on or cast off must be at least fifty-six feet. Another circumstance of great importance, in which all the American floating docks differ from the above-described caisson, is in giving far greater breadth than sixty-four feet to a dock destined for ships of the line; the least of those submitted to our consideration being eighty-five feet, and some extending to nearly two hundred feet in breadth. Another material difference between the caisson and the American docks is, that the latter provide an opening by which the ships enter endwise, and thus require, in addition to their own draught of water, no more than the thickness of the bottom of the dock. This was a distinguishing feature in the floating dock of Commodore James Barron, of which a working model, now in the Patent Office, at Washington, was constructed, and exhibited in action, at Norfolk, many years ago.

The principle of action of all floating docks is extremely simple. It depends on the bulk of water which the dock displaces, when the weight of the ship is added to its own weight. The mode in which this displacement occurs may be different in the different plans of construction; but, as there is no limit except depth of water and superficial area, it is evident that where these two elements are unlimited, the weight which may be placed on a floating structure of corresponding dimensions and strength must likewise be unlimited. When the form of the dock is that of a prismatic body, like the caisson above described, or like Commodore Barron's dock, or that of Mr. Gilbert, hereafter to be described, the amount of displacement, and the consequent depth to which it would sink, is a matter of the simplest calculation. To determine the draught of water of such a dock, either when light or when loaded, we have only to know the area of its horizontal section, and the weight of the dock and ship. Thus, if the length of such a dock be 240 feet, and its breadth 85 feet, and if the weight of sea water be taken at 64 lbs. per cubic foot, so that 35 cubic feet make a ton, then, for every foot that the dock sinks, it will displace 20,400 cubic feet of water, weighing 585 tons; and if we suppose the dock to be so ballasted as to weigh as much as the largest ship of the line, (the Pennsylvania, for example,) with all her rigging, stores, crew, and armament on board, which may be taken at 5,200 tons, then the total weight of dock and ship will be 10,400 tons, and the depth to which it would sink would be 17.77, or say 18 feet.

When, on the other hand, instead of an enclosed dock to receive the vessel, and allow the water to be pumped out from around it, the structure receives the form of a broad trussed platform, with water-tight tanks between the trusses, which may be pumped free of water, after being sunk beneath the bottom of the vessel, then the computation of lifting power will depend on the interior capacity of the tanks—that is, on the weight of water which can be withdrawn, to be substituted by an equivalent bulk of air. The submerged timbers of the dock, when the ship has been lifted with her keel quite above the water line, will not then be a matter of any importance, as their density will be so near that of sea water as to render their weight of no amount, and consequently the only weight to be supported will be that of the ship, and of the timbers and machinery of the dock which then lie above water. The principle of computation just stated applies equally to docks built in sections, and to those forming continuous structures. It is evident that, by thus placing the lifting power at some distance below the bottom of the keel, a considerable depth must be given to the truss work—more than would be necessary for the mere support of the ship when resting upon them.

The number of plans of floating dock which have been submitted to the commissioners is seven.

1. The floating balance dock of Mr. John S. Gilbert, the vessel resting in the bottom of the dock, and the water kept out by a gate at the end.

2. The sectional tank dock of Mr. John Thomas.

3. The sectional tank dock of the Floating Dry Dock Company of New York.

4. The sectional floating dock and floating wharves of Mr. Blanchard.

5. The combined tank dock of Mr. Von Schmidt, using condensed air to force the water out of the tanks through holes always open at their bottoms.

6. The combined tank dock of Messrs. Schull and Martin.

7. The combined or sectional tank dock of Mr. Edward Conover.

First. From the above brief enumeration, it will be seen that the dock of Mr. Gilbert is the only one which depends on the caisson principle. It is, in fact, constructed with a middle compartment, in which the vessel rests after the water has been pumped out, and two side and one end compartments, formed by timbers and planking, sloping outwards from a few feet on each side of the keel blocks towards the upper edge of the sides. These side compartments have therefore the cross section in nearly a triangular form, and consequently the inner sloping wall presents facilities for shoring the vessel very similar to those in a walled dry dock. The side chambers allow of the disposition of any desired quantity of ballast to sink the dock, keep low the common centre of gravity of the dock and ship, and so to load the ends of the flooring cross-timbers as to equalize the strain above and below when the ship is in place. They may also retain a quantity of water after the space around the ship has been pumped dry, and, being divided into compartments fore and aft, this water may be so adjusted in the several parts as to preserve the ship in an upright position.

In a dock 110 feet long and 45 feet wide on the outside, which has been for upwards of two years in use in the North river, and in which, during that time, the owner stated that he had docked between 250 and 300 vessels of various sizes, the commissioners witnessed the docking and undocking of a vessel of about 300 tons. The lowering of the dock into the water, by letting fall the gate which moves on a hinge at the bottom, and is so ballasted on the outside as to sink, and the getting in and arranging the position of the vessel, took twenty-five minutes; after which a small four-horse engine was set in motion, and at the end of one hour and thirty-five minutes the water was out of the central compartment of the dock, the vessel shored, and the operations on her bottom had been commenced. The only persons employed to assist Mr. Gilbert in this operation were two men and two boys—one of the men being the fireman and engineer, who attends to all the operations of the machinery.

The process is so simple, that any person of ordinary capacity could, by seeing it done once, be competent to direct its repetition.

The lowering of the brig into the water again took about thirty minutes, and was effected by simply opening and letting fall the gate regulating its descent by tackles, after admitting a certain quantity of water through two wickers near its bottom. This operation is, therefore, if possible, still more simple than the other, and scarcely admits of a possible mistake. When the water has risen to a certain height in the middle compartment, gates are opened, to permit it to flow into the side chambers, which expedites the sinking of the dock. In construction this dock presents great solidity and strength; the sides are to be constructed of timber a foot in thickness to the load line, and six inches above it; the interior bracing of the side compartments is most ample, and in a dock for ships of the line the bottom is proposed to be made 3 feet 9 inches thick, of timber, with truss beams 2 feet 9 inches high, on which to place the keel blocks. This thickness of 6½ feet of solid timber under the support of the keel would doubtless constitute a very firm foundation on which to establish the keel blocks, and sustain the weight of the vessel.

A dock on this plan, 240 feet long, 85 feet wide, and 33 feet high, coppered and copper fastened, has been proposed to be built by Mr. Gilbert for $250,000. If built inside of an iron tank, as high as the load line, his proposal is $10,000 in addition. If chained, felted, and sheathed with boards, the estimate is $215,000; and if without either felting or sheathing, $200,000, according to the accompanying paper, (marked A,) which is herewith submitted. A transverse section of the dock is given in the accompanying drawing, (marked B,) and some remarks on the results of experiments on the exhaustion of tanks, by the inventor of the above-described dock, in the paper marked C. Without expressing our assent to all the positions assumed in the last-mentioned paper, we may state our conviction that some of the remarks relative to the two different methods of constructing floating docks are entirely pertinent and just, and, together with the dock which he has in use, evince much discernment and practical tact in the adaptation of simple means to the accomplishment of important ends.

The advantages and disadvantages of this dock may be summarily stated, as follows:

The *advantages*, as compared with other floating docks, are—

1. The simplicity of construction, and, in consequence of this,

2. The facility of management, as already described.

3. The great strength which can be given to the sides, and indeed to all parts of the structure, without impairing its lifting power.

4. The little depth of water which it demands, beyond what is necessary to float the vessel, being only 5 feet 9 inches for a dock to take up ships of 400 tons, and 8 feet for one destined to receive the largest ships of war.

5. The lowness of the centre of gravity of the whole mass of the ship and dock, the keel not being required to rise, as in all the other floating docks, two or three feet above the level of the water, outside of the dock.

6. The facility, in consequence of this stable condition of equilibrium, with which the dock may be conveyed from point to point, without endangering the structure, even while the vessel is in place, provided a proper advantage be taken of the state of the weather for such removal.

7. The convenience of shoring from the slopes of the side compartments to the sides of the ship, without using props of inconvenient length, and especially of cumbrous *weight*, the latter increasing more rapidly than the length when a given amount of strength is required in a prop.

8. The facility with which, by properly ballasting the side tanks, the upward and downward pressures on the bottom of the dock can be equalized so as not to bend or unduly strain the bottom.

The *disadvantages*, as compared with other floating docks, are—

1. It does not afford so much free space in which to work as most other floating docks.

2. It does not bring the vessel entirely above the level of surrounding

obstacles, so as to give a strong light on every part of the bottom. This objection is, however, less weighty in Mr. Gilbert's dock than in one which is excavated and walled.

3. It cannot receive more than one vessel at a time, which is another disadvantage which it has in common with the permanent dry dock.

Mr. Gilbert has stated that he could, without increasing the cost of his dock, add 5 feet to the breadth, making it, in all, 90 feet wide. This would increase the stability by about one-ninth, and the lifting power by one-seventeenth of the amount above supposed. It would also allow larger side compartments in which considerable quantities of water might be occasionally left to aid the ballast in keeping the dock lower in the water than it would otherwise lie. This would keep the centre of gravity of the ship, it is true, nearer the level of the water than before, but the centre of gravity of the dock and its contents would be raised nearly in the same proportion by placing masses of water high up the sides; so that, as a measure to obtain stability, it might not be found essentially useful.

Second. The dock of Mr. John Thomas is constructed in sections, each about 33 feet wide, 85 feet long, and 9 feet deep, with tanks within the whole, to contain 21,400 cubic feet of water, weighing 611 tons. Seven such sections, making a total length of 231 feet, and a total lifting power of 4,277 tons, are proposed to be joined together, to form a dock for ships of the line. The ends of this dock being entirely open, and the upright sides being also open frames, the vessel must of course be lifted entirely above water level. Allowing for the usual height of keel blocks two feet, there will be demanded by this dock at least 11 feet of water, in addition to the draught of the ship to be docked. Thus a depth of 36 feet of water would be requisite to dock a ship of the line drawing 25 feet. Mr. Thomas preserves the stability of his dock by means of floating wharves extending the whole length on each side, and connected by chains passing over pulleys, with projecting timbers reaching beyond the upright frame work of each section. By means of weights attached to the opposite ends of the chains, the wharves may be made to serve the purpose of buoying up any desired portion of the weight of the dock. The machinery for pumping out the sections was not exhibited, nor was it stated whether the working of the several sections was to be simultaneous and equable or not. The inventor is understood to have employed a dock on his plan, for several years, at St. Louis, on the Mississippi, taking up steamboats of all sizes. As the principle of Mr. Thomas is embraced, together with some additions by others, in the dock next to be described, it will not be necessary to state separately its advantages and disadvantages. The paper marked K is a letter from Mr. Thomas, giving information in regard to the construction of his dock.

Third. The commissioners were enabled to study the subject of sectional floating docks in a practical way at the establishment of the floating dry dock, foot of Rutgers street, East river, where the plan is in daily operation. The dock there erected is in seven sections, each 93 feet in the extreme length, 24 feet in breadth, and 11 feet 3 inches in depth. This depth, added to two feet in the height of keel blocks and of the lower timbers, makes the depth of water necessary to use it 15 feet greater than that of the ship to be docked. The submerged tanks of a section contain 10,100 cubic feet, or 283 tons of salt water. Two buoyant tanks, one at each end of the section, 20 feet long, 10 wide, and 7 deep, are capable of displacing each 40 tons of water. These, with the submerged tanks, will therefore exert a maximum lifting power of 363 tons. The company use the seven sections at present in two docks—one composed of five sections, for taking up large ships and steamboats, and the other of two sections, for docking smaller vessels.

The operation of docking consists in first lowering the docks to a sufficient depth, according to the draught of the vessel. This is effected by raising, with the aid of a steam-engine placed on the top of one of the sections on each side of the dock, the buoyant side tanks of all the sections. Their weight, together with the ballast which they contain, is sufficient to sink the dock. A line of shafting, running horizontally from section to section, causes all to move with the same speed; and the strong cast-iron racks attached to two upright posts of the sections effectually suspend the tanks at any desired level and keep down the dock. When it has been lowered to a sufficient depth, the engines are stopped, the ship is brought in, and, by means of gauges on the horizontal wale shores, placed on both sides, is adjusted with her keel directly over the blocks. The pumps which exhaust the water from the submerged tanks are then put into uniform action in all the sections, and the consequent rising of the dock soon brings the blocks in contact with the keel. Bilge blocks, sliding on cross-timbers over the floor of the dock, are then drawn forward by ropes until they come in contact with the lower part of the vessel. The pumping then goes on until the floor of the dock is wholly above the level of the water, and the bottom of the keel of course about 2½ feet higher.

The performance witnessed by the commissioners was that of the *five-section* dock employed in taking up the Metoka, a merchant ship, of which the custom-house register of tonnage was stated to be 776 tons. In this case, the time employed to sink the dock was 25 minutes; to bring in and adjust the position of the ship took five minutes. Her draught of water, in consequence of having 200 tons of ballast on board, was a little more than 10 feet. The lifting continued 3 hours 22½ minutes, so that the whole time employed in preparing and docking this vessel was 4 hours 38½ minutes. The engines are of 8-horse power each, and, during the time the vessel is rising, are employed either successively or simultaneously on the pumps, and in depressing the floating side tanks. In the early stages of the process, as the water had to be pumped out against a superincumbent head of 13 or 14 feet, the two operations were alternate. In the latter part of the time, they were occasionally both carried on together.

It should be mentioned that the operations of the workmen on the bottom of the ship were commenced 30 or 40 minutes before the engines stopped, the remainder of the time being taken up in getting the dock floor some inches above the level of the water, and accurately trimming the ship in due position. There are required in docking a vessel on this plan one principal engineer, who usually occupies the deck of the ship, two steam-engine tenders, and two hands on each side of the vessel to manage and adjust the wale shores. In about 24 hours the vessel had been freed from the foulness with which she came out of the water, and completely coppered. The commissioners then witnessed the process of lowering her into the water, which commences by opening gates in the lower part of the submerged tanks through tubes which descend from the top of the side frames in the engine room on each section. The steam-engine is also put in motion, to raise the side tanks, which might otherwise be carried wholly under water. By the gauge marks on every section, the engineer on the deck of the ship, by passing from side to side, observes whether the descent is uniform in all parts, and directs the persons managing the gates to increase or diminish the flow accordingly. When the vessel has been in part brought to rest in the water, the danger of deranging her position by allowing the water to flow too rapidly into any one tank is so much lessened that the gates are opened to their full extent, and the side tanks raised pretty rapidly, to allow the dock to sink readily and set the ship afloat. The lowering of the Metoka took just 40 minutes. This dock is understood to have been in operation for about eighteen months, and to have taken up from 100 to 200 vessels of various sizes. Under the discreet and skilful management of the ingenious mechanics by whom it was designed and constructed, it has continued to perform its work successfully, without accidents, as we were assured, and without requiring any outlay for repairs. The ample breadth of the dock (65 feet between the upright side frames) enables it to take up two small vessels at a time, instead of a single large one, so that when arranged, as at present, in two docks, three, and even four vessels may be undergoing repairs at a time. To take up long steamboats, the whole seven sections are put in requisition to constitute one dock. The two-section dock, as at present used, is pumped and worked wholly by hand. The floating side tanks are raised and lowered by means of a square vertical shaft coming down from the engine room above and moving a level wheel which is attached to a frame on the tank, and sets in motion a system of tangents, screws, wheels, and pinions, which connect the tank with the tooth-rack already referred to. The amount of machinery thus required to raise and lower the tanks and to work the pumps is, in the present docks, stated to be about two tons on each side of the section.

A part of this machinery remains constantly near the level of the water, while the rest rises as the dock rises. The latter is of course the case with the steam-engines, boilers, &c.

The mode of constructing and propping the interior of the tanks was explained, and that of trussing the sectional frames was exhibited by pumping out one or two sections until they came to draw not more than three or four feet of water.

This dock, which, as stated by one of the proprietors, embraces the plans of J. Thomas, Wash & Williams, —— Mitchell, together with those of Dodge & Burgess, was greatly admired for its ingenuity, which reflects much credit on the constructor, himself one of the inventors, by whom the several elements were combined in a manner to produce the effects above described.

The dock which this company proposes to construct for the Government is planned with an extreme breadth of 137 feet, with two submerged tanks in each section, each 45 feet long, 18 feet wide, and 10½ feet deep, clear internal capacity, independent of the props and cross-timbers of the insides. The capacity of such tanks will be equal to 489 tons of sea water. The two side tanks are proposed to be 20 feet square and 8 feet deep, so that their total displacement will be 188 tons, giving the maximum buoyancy of a section 677 tons, and for eight sections of 24 feet each, sufficient to occupy the length of keel (195 feet) of a line of battle ship, will be 5,416 tons. The part of the dock and of the machinery out of water, when the ship is raised, is estimated at 65 tons to a section, or for eight sections, 520 tons. This added to 5,200 tons, the assumed weight of the Pennsylvania, makes the weight to be lifted 5,720 tons, about 300 tons more than the calculated power of the dock, supposing it pumped entirely dry. By making the submerged tanks 11.5 deep in the clear; and the side tanks the same as above, the buoyancy would be 5,760 tons, (gross,) and, by increasing the side tanks to the same depth as the submerged ones, the whole power would be 6,358, or 638 tons more than the weight to be sustained, which, considering the construction, is certainly not an excess.

We will now proceed to state what appear to us to be the advantages and disadvantages of this dock.

Its *advantages* are—

1. That of adapting itself in some degree to the form of the keel. The commissioners do not attach great importance to this feature, since every other form of dock which they have witnessed has some equivalent method of adjusting the supports to the form assumed by the keel when afloat.

2. As it takes a vessel entirely above the water level, and as its ends are open and only a moderate quantity of frame work is placed on the sides, there is an abundance of light and air.

3. It is capable of being elongated or contracted, to suit the length of the vessel to be docked, thus saving a portion of time and labor in pumping out a large dock to raise a small ship. The *two-section* dock, above referred to, has a greater length than the breadth of the two sections which it receives by means of a temporary platform of planks and keel timbers, extending from one to the other some 15 or 20 feet.

4. In consequence of being separable into sections, the whole dock may be conveyed, if necessary, to a distance through narrow channels. The supposed utility of this feature, set forth by the proprietors, could not, however, be available in conveying a Government dock through a canal, since the length of 137 feet is believed to be greater than that of any locks in the country.

5. It is capable of being repaired in sections by taking out one at a time on the tops of high blocks placed on the floors of the rest. In other words, a section may be docked just as a ship would be in its place, or a new section may be built to replace one found to be worn out.

In the accompanying paper marked D, the president of the company, Mr. S. D. Dakin, has set forth several other supposed advantages; to which, however, the commissioners do not attach the same importance as is claimed by the writer, and some of the positions they think wholly untenable, especially those which relate to the *waterlogging* of the dock and its behavior when acted on by waves.

The *disadvantages* of this dock are—

1. It has the buoyant power at the bottom wholly below the weight which it is to carry, thereby rendering additional machinery, in the form of buoying tanks, and a great breadth of the structure, necessary. Without these, the equilibrium would be essentially unstable, like that of a vessel carrying a deck load without ballast in her hold.

2. The draught of water is very considerable. Fifteen feet below the bottom of the keel of a ship of the line would amount to 40 feet in all—a depth believed not to be attainable at any of the navy yards in the United States without artificial excavation. This objection may, it is true, apply in some degree to all floating docks, but especially so to those which place the buoyant power beneath the vessel to be raised. To get rid of this, an increase of breadth becomes inevitable.

3. The tanks being by their construction independent of the frame work which they support, and capable of being drawn out as occasion requires, they must possess a strength which that frame does nothing to afford, in order to resist the enormous pressure brought upon them when the water first begins to be pumped out at a great depth, amounting in fact to 12 or 13 pounds per square inch when the tank is 28 feet below the water. This loads the upper surface of the two tanks in a section to the extent of nearly 1,300 tons in such a dock as the company propose to build for the Government, while its true lifting power, when the dock comes to the surface, would be less than half that amount. Hence it is evident that the propping must be very substantial.

4. As it lifts the ship high up into the air, it affords full exposure of her broadsides, masts, spars, and rigging to the action of the wind. The centre of figure of a longitudinal vertical section of such a ship as the Pennsylvania will be higher than her centre of gravity. The area of that section is 11,760 square feet; and, in order to convey some idea of the influence which winds of different degrees of velocity might produce, tending to displace the ship when thus elevated, the following table has been calculated. The side surface of dock below the keel is left out of the account.

Character of the wind in respect to force.	Velocity in feet per second.	Velocity in miles per hour.	Pressure exerted on the broadside of a ship of the line in tons.
1. A brisk breeze - -	20	13.6	4.8
2. A very brisk breeze -	30	19.5	10.84
3. A high wind - -	50	34.1	26.89
4. A very high wind - -	70	47.7	58.79
5. A storm or tempest -	80	54.5	76.85
6. A great storm - -	100	68.2	120.08
7. A hurricane - -	120	81.8	172.86
8. A violent hurricane, such as tears up trees - -	150	102.3	270

To calculate the effect of the last-mentioned wind, admitting that the masts and spars produce an effect equal to one-tenth of the hull, we should have in all 297 tons applied opposite to her centre of figure, at the height of more than 28.5 feet above the keel. As the dock is supposed incapable of moving sidewise, the moment of force, therefore, tending to turn the ship on her keel as an axis, will be $297 \times 28.5 = 8,464.5$ tons applied at the distance of one foot. The sustaining force tending to resist this overturning is the strength of the props acting on the buoyancy of the side tanks. These latter will apply their resistance at the distance of 56 feet from the centre of the dock. We find that the force tending to depress the leeward side of the dock, when applied at that distance, will be 151 tons; and as the buoyant power to resist it is to be derived from 8 floating tanks, each

20 feet square on the base, the whole effect of sinking one foot is to displace 3,200 cubic feet of water, weighing 91.5 tons. If this be supposed, the only resistance to careening the dock might, on the leeward side, be depressed 1.65 feet, or 20 inches; and the line of direction from the centre of gravity will be carried about $8\frac{1}{2}$ inches to leeward of the centre of the keel. This is the calculation of an extreme case, it is true; but if a ship were to remain some months upon the dock, it would be by no means unworthy of consideration. The upright, with sliding tiebands fastened to the piers, according to the present arrangements of the company, would, in a measure, counteract this tendency to inclination, and the consequent rocking motion; but the tendency would remain, and be felt to a certain extent.

5. A still more serious disadvantage of this dock is the complex nature of the structure, and the consequent skill and caution required in its management. In the hands of those who feel the naturally deep interest of inventors in its success, and who use it daily, it works without difficulty; but, if used by those who should be only occasionally called upon, and especially by those who should for the first time attempt to dock or undock a ship, it is easy to foresee that much embarrassment might occur.

6. The great length of props demanded for properly shoring a large vessel on a plane horizontal surface is an objection to this, in common with other docks constructed on similar principles.

7. The great breadth which this dock would occupy, and at the Brooklyn navy-yard the great extent of excavation which would be required in order to afford it a berth, would be serious inconveniences. Its breadth would be 47 feet greater than that of Mr. Gilbert, and its depth at least 7 feet greater from the tops of the keel blocks to the bottom timbers of the dock.

8. Its expensiveness is stated to be $88 per ton, of capacity for any amount under 4,500 tons; and this, for a dock of 5,200 tons, would bring the dock alone to $457,600, about half the amount of the lowest estimate of a walled dock. If nothing were charged for the power beyond 4,500 tons, it would still cost $396,000 at the rate proposed. This is $136,000 more than the highest estimate of Mr. Gilbert. It does not include the preparation of a site. The accompanying letter (marked E) from Mr. Dakin proposes to prepare the site, build two piers, (of piles,) with a crib of stone at the end of each, and form a floating boom to protect the entrance, for the sum of $13,000. It is the opinion of the commissioners, that, in order to render such piers permanent, a much greater sum would be required.

Fourth. The sectional floating dock and floating wharves of Mr. Blanchard are essentially dependent on the same principle as the two preceding. Tanks are placed under the ship, out of which the water is to be pumped by an engine elevated far above the floor of the dock; the two ends of the section are made to rise equably by an iron shaft traversing the top of the tank, under the floor of the dock, and having a pinion at each end, to take hold of a vertical rack in the timbers connected with the two floating wharves. The two wharves are connected together by timbers going down as low as the tanks are ever to sink, and are tied by cross-timbers at the bottom, and at a certain distance up. There is a lattice truss in the interior of the tanks, and the sides of the tanks themselves are formed of timbers which constitute a species of truss. By these expedients, the support for the ship and that to sustain the inward pressure on the tanks, when exhausted far below the surface of the water, are in a manner combined. No specifications having accompanied the model of Mr. Blanchard, it is not necessary to enter into an examination of its advantages or disadvantages. Nearly all the objections already stated against the two preceding docks would equally apply to this.

Fifth. The combined tank dock of Mr. Peter Von Schmidt, called the "floating pneumatic dock." The model first exhibited to the commissioners by the inventor had cylindrical tanks arranged and lying horizontally at the bottom of a frame work. At the lower side of each was an opening, to allow a free passage of water into and out of the tank. Into the upper part of each entered a small tube, connected with a metallic cylindrical reservoir of highly condensed air, forced into it by an air syringe of the usual form. The ship being brought over the dock, the several connecting stop-cocks were turned, and the air rushing into the tanks, and driving the water through the openings in their bottoms, rendered the whole structure buoyant, raising the ship above the level of the water. The great and fatal objection, in the minds of the commissioners, to the principle of obtaining buoyancy for this dock, by means of condensed air, is, in their view, sufficient to decide against its adoption. The difficulty of obtaining wooden, and even metallic boxes, which will retain air for a great length of time in a state of compression, is a fact familiar to all who have had occasion to make the experiment; and, even supposing the tanks made perfectly air-tight at first, they could not be secured in that degree of tightness for any length of time, as, on the cylindrical-tank model, a dock for a ship of the line would have required 43 feet of water. Mr. Schmidt subsequently presented the accompanying drawing F, the specification G, and the estimate H, which will sufficiently explain the views of the inventor, but do not remove any of the essential objections, except that against the draught of water.

Sixth. The combined tank dock connected with permanent piers, invented by Messrs. Schull and Martin. This dock depends, in part, for its lifting power on the exhaustion of tanks, and in part on the lifting power of machinery established on the permanent piers at the sides of the dock, the latter being intended to preserve the stability of the dock.

If established on a lake or inland sea of invariable height, this dock might possibly fulfil its design; but where the tide rises and falls, the machinery of rack-work and pinions would be liable to speedy derangement. Besides this fatal objection, the dock requires 48 feet of water to place it in order to take on a ship of the line—nearly double as much as the average depth in the channel near the navy yard at Brooklyn. It is not intended to deny that, with proper solidity of piers, and with strength and massiveness of machinery, a dock might be constructed which, without the aid of any buoyant tanks, might lift a ship of the line; but the character of a floating dock would be merged, and the expensiveness of a walled permanent dock would be, if not equalled, at least pretty nearly approximated, without attaining the permanency desired in all works of a national character. The paper marked I is a statement from Mr. W. A. Cox, relative to the construction and advantages of this dock.

Seventh. The model of a floating dock, stated to have been invented and patented 18 years ago, was exhibited to the commission by Mr. Edward Conover. Large tanks to contain water were represented as established on solid piers at the sides of the dock, at the height of 25 or 30 feet above the level of water in the basin. These were to be pumped full of water. At the bottom of the dock were empty water-tight tanks, to be forced down low enough to receive the vessel. This was done by filling a set of tanks along the top of the dock, sustained on strong upright timbers. Water was to be allowed to flow from the permanent water tanks on the piers, in quantity equal to the weight of the ship and dock. This would sink the air tanks. The ship was then to be brought on the tops of the latter, and the moveable water tanks were to be allowed to empty their contents through gates or stop cocks into the basin below, and allow the air tanks to elevate the ship. This dock has never been brought into use, and the above description will probably suggest a sufficient explanation of that fact.

Having thus gone through with an account of the character, advantages, and disadvantages of the several plans of floating docks, compared with each other, as required by your *second* direction, we are in a condition to offer some definite views in regard to the *first* query, viz: "*Advantages and disadvantages of any floating dock, as compared with those of an excavated or walled dock.*"

The *advantages* are—

1. The smallness of the original cost, the estimates varying, for the two principal plans now in use in this city, from $200,000 to $396,000, exclusive of the preparation of a site, while the excavated or walled dock may cost, according to different estimates, from $900,000 to $1,200,000.

The preparation of a site, excavating, building piers, forming protecting booms, must largely enhance the above estimates for a floating dock, as already suggested.

2. The short time required to build the floating dock—six or eight months being the time assigned by several of the persons offering to undertake it, and as many years being generally allotted to the construction of a walled dock. If the Government were at war, and had, in the harbor of New York, several disabled vessels, which could not make their way either to Charlestown or to Norfolk, and the question was, the most speedy method of getting docked, it would doubtless render this consideration important, independent of the loss of interest or cost between the commencement and the completion of a walled dock. Such is not, however, the situation of the Government. If ever built for an emergency like that supposed, the simplest form should be preferred.

3. More space may be generally allowed for working, with a better light and less humid air.

4. They take all vessels up from the level at which they float, and do not, like the walled dock, carry even the smallest craft down to the same blocks on which the keel of a ship of the line must rest, and they require a proportionately less labor, as the draught of water is less. This advantage is of but little practical importance in the naval service.

5. The sectional floating docks can take up more than one small vessel at a time. Where a dock is used to earn profit to its owners, this may be of much importance; but the urgency of naval requisitions can seldom give it any importance at our navy yards. Indeed, if our present dry docks could have all the vessels wanting repairs in the navy brought to their

gates, it is believed there could seldom occur much delay in one vessel waiting for another.

The *disadvantages* of the floating docks are—

1. Their perishable nature, being liable to decay, to conflagration, and to damage from violent gales of wind. The copper with which they might be covered would be liable to speedy corrosion, especially at the Brooklyn navy yard, where it is represented that the gases rising from the mud are particularly injurious to sheathing copper.

2. The great surface and depth of water which they require, rendering it imperative to excavate a hole or well over which to place the floating dock at the Brooklyn navy yard, before any one of the proposed floating docks could be brought into action on a large ship. The accompanying paper (marked L) contains notes, furnished by Captain Perry, in relation to the width and depth of channel at the navy yard, Brooklyn.

3. The great risk of placing a large heavy ship for weeks or months on a buoyant platform for extensive repairs, with the possibility that such repairs might be suspended for want of appropriations, or from other causes. Such repairs not unfrequently require several strakes of plank to be removed, or part of a keel to be taken out; and it is not often convenient to force the completion of such work by hiring extra hands, but it must be done by the force in employ at the yard. The placing of so much public property as a large national vessel in so hazardous a situation as that just referred to could not but be deemed an act of temerity.

4. If placed between piers, and not effectually secured against chafing, the copper might be worn off in spots and admit the worms, which, in such a harbor as that of Pensacola, would soon destroy the timber of a floating dock.

5. Designing persons might, unless it were strictly guarded, easily perforate the sides of a floating dock just below the water level, and thus let in water to one side, or to one or more of the buoyant tanks, of a floating section dock, even through the copper which has been proposed to be put upon them. With a large ship on the dock, and her planking partly off, such an occurrence would lead to serious consequences.

6. The floating docks are, without exception, more difficult to manage than a walled dock, as the latter require no nice attention to the adjustment of level. If trimmed, when she goes into a walled dock, the vessel can be at once shored against the solid walls in such a manner as to defy all accidents. This does not in any degree depend on the greater or less rapidity of pumping out water from one or another part of the dock, as all is pumped out from the same part.

If not a substitute for the walled dock, we cannot regard the floating dock important as an auxiliary at the Brooklyn navy yard, since, if a permanent dock be erected there at all, it will be adequate to all the repairs which the Government are likely to have occasion for at that station.

In addition to all the other objections to a floating dock for Pensacola, it may be mentioned that the temperature of the climate at that place would cause a more speedy decay of the timbers than in the harbor of New York. For *naval purposes* a permanent walled dock is deemed preferable to all others, being at all times available, and never liable, like every floating dock, to be found out of repair.

Should any sudden emergency hereafter require the erection of a temporary substitute for a walled dock, the foregoing statements will sufficiently point to the "*balance dock*" of Mr. Gilbert as the one which your commissioners decidedly prefer, on account of its simplicity, solidity, stable position, and ample buoyant power—in short, for its nearer approximation than any other to the character of that for which it would be a substitute, namely, the walled dock. If built in a wrought-iron tank, as he has proposed, and suitably galvanized to defend it from corrosion, the chances of injury, either from accident or design, would doubtless be greatly diminished.

Having thus given to the subject as full, minute, and particular examination as the case seemed to demand, we have only to submit the result to your hands, with the assurances of our most respectful consideration.

BEVERLY KENNON,
Captain U. S. Navy.
SAMUEL HUMPHREYS,
WALTER R. JOHNSON.

Hon. A. P. Upshur,
Secretary of the Navy.

A.

New York, *October*, 1842.

Gentlemen: Herewith are transmitted proposals for building a floating dry dock on my plan, called the "floating balance," of sufficient strength and capacity to dock the ship of war Pennsylvania, weighing 5,200 tons. For proposals in the proper form, I would respectfully refer to my proposals sent in on the 1st of last September to the Navy Department, agreeably to the advertisements of the Secretary of the Navy.

I would also refer the commission to the accompanying description for explanation for the methods of constructing, upon which the prices are based.

For a floating balance dock, coppered and copper fastened, the sum of - - - - - - -	$250,000
For a floating balance dock, built inside of an iron scow, the sum of - - - - - - - -	260,000
For a floating balance dock, charred, felted, and sheathed, the sum of - - - - - - - -	215,000
For a floating balance dock, without either felting or sheathing, the sum of - - - - - - - -	200,000

My understanding the commission to specify that 5,200 is the required strength and lifting power of the dock, has caused me to slightly vary my price from my proposals now in the Navy Department.

JOHN S. GILBERT.

Capt. Kennon,
Col. Humphreys,
Prof. W. R. Johnson,
Commission on Dry Docks.

Length of dock, out to out - - -	240 feet 0 inches.
Breadth " - - - -	90 " 0 "
Depth " - - - -	33 " 0 "
Thickness of bottom - - - -	3 " 9 "
Thickness of sides to load line - - -	1 " 0 "
Thickness of sides above - - -	6 " 3 top sides.
Truss beams, sufficient, by actual trial by hydraulic press, to sustain - - -	5,200 tons.

Thickness of bottom. - - - -	3 feet 9 inches.
Truss beams - - - - - -	2 " 9 "
Keel block - - - - - -	1 " 0 "
Cap pieces, to split out - - - -	0 " 6 "
	8 " 0 "

Gentlemen: After two years' experience in docking vessels, I now respectfully give my opinion on the subject of my balance dry dock.

I believe a floating dock on my plan, eighty-five feet wide, and two hundred and forty feet long, loaded with sufficient ballast to sink it with all gates open, would have sufficient stability throughout the entire operation of docking and undocking the ship Pennsylvania in any weather, even if the centre of gravity of the dock and vessel, considered as one body, should be above the water line, because the distance from the keel of the vessel to the end of the lever (or side of the dock) would be nearly as great as from her keel to her spar-deck, and the draught of the dock would be fifteen feet; this would give an average pressure against the sides of four hundred and eighty pounds to every square foot.

In case the wind should blow very hard, and the least danger was apprehended, water may be let into the side camels, and the dock settled down; this would make the dock more stiff, and at the same time leave the dock dry for the workmen.

I find that I can dock a vessel when the sea runs high, because the waves cannot escape at the sides or at the solid end; and before they can back out, others heave in, and keep the vessel from striking upon the blocks.

It is generally believed that timber, well charred, may remain under water many years without being touched by worms. I would therefore respectfully suggest that the bottom of a floating dock may be burned, and then covered with felt and sheathing, so as to be secure from worms as long as the dock would last; but, for the port of New York, no sheathing of copper, iron, or wood, is at all necessary, because, if the dock is floated into fresh water once in two or three years, the worms will be destroyed. This may be done by a Government steamer in ten hours, by floating it up the Hudson river; or it may be done for $250 up, and the same amount down, by a private steamer, and the same course may be taken where there is a fresh water river near.

I would ask the attention of the commission to my mode of constructing my balance dock as far up as the load line. In the first place, lay an entire thickness of timber crossways, and caulk the upper side with wedges. I then build up the sides and ends of thick timber, bolting one course or streak on to another, and caulk these seams also with wedges. I then lay a thickness of timber on the bottom, fore and aft, and caulk it with wedges, and then another thickness crossways, and caulk that also with wedges; inside of this scow, I build my dock. It will be seen, therefore, that I build from the inside, and, of course, all repairs must be made from the inside.

In regard to resheathing or recoppering the under side of the bottom, my plan is, to remove all the ballast, and put across a few temporary deck beams and stanchions under them to stiffen the dock, and then fill one side of the dock with water. This would careen the dock so as to get at least a part of the bottom; but in any place where there is five feet rise and fall of water, string pieces may be laid parallel to the shore, and the copper or sheathing laid upon these string pieces; they should incline in the width of the dock five feet. Water is then let into one side of the dock to cant it, and in this way it may be floated on to the ways, and coppered, by tides, half way down, and then floated and turned the other side to the shore. But the plan which has always seemed best to me is, to build an iron scow, and then build the dock inside of it. I would here state, that no danger need be apprehended from worms on the inside, as salt water will stagnate in twelve hours when there is but a small quantity in the dock, and in that state the worms immediately die.

Another method has been suggested to me, which is, to lay ways, with a channel in them for common balls, and haul the dock entirely out of water.

In my explanations before the commission, I believe I neglected to mention that I do not pump the water from around a vessel in my dock when she is less than one hundred and fifty tons; for, when I dock a vessel of that weight or less, I pump the water out of the side chambers, and, as the dock rises, the water ebbs out at the wicket gates. And a frigate may be raised nearly out of the water by the power of the chambers, when in a dock large enough for a ship of the line: thus much time is saved. Although the sides are thirty-three feet high, the openings are made to extend down to near the load line of the dock, and these gates are made to shut over the openings in bad weather.

JOHN S. GILBERT.

Capt. Kennon,
Col. Humphreys,
Prof. W. R. Johnson,
Commission on Dry Docks.

[Here follows a diagram, marked B, in the original.]

C.

Gentlemen: Having been assured, by the honorable the Secretary of the Navy, that a full opportunity would be afforded me to lay all the information which I had collected and obtained, by experiments, before the commission which would examine floating dry docks, I take this method of presenting an outline of the results of actual experiments made by me from about the year 1825 up to this time.

About the year 1825, a floating dock was built in this city. I witnessed the first attempt to dock a vessel in it, but it went to pieces on its first trial.

It was evident to me that the failure of that project was owing to the entire ignorance of the inventor. The sciences involved in the construction of a machine that has its centre of gravity so far removed by the introduction of a weight into it in the form of a ship have a wide range; but I am satisfied there are but two methods of applying the floating principle to the purpose of raising ships out of water: by one method, the ship is raised out of water on the tops of exhausted tanks, which is like loading a ship on deck and leaving her hold empty; by the other method, the ship is floated into an enclosure, and raised out of water by pumping the water from around her. This is like putting the cargo into the ship's hold.

The following are the characteristics of the tank or sectional floating docks; and my object is to draw your attention, in order that the positions may be examined at your leisure.

The philosophical objections to a sectional tank dock are as follows:

Firstly. The natural lifting power of water is exerted in an exact perpendicular direction. If the sides of a nearly exhausted tank, which is held under water by a load on its top, cannot, in the slightest degree, form a perpendicular line, the keel block at the lower end receives less support than its due, and what is lost at that block is doubled at the block at the opposite end. The tendency of the pressure is to the highest point; therefore there is no reliable support to the ship at any other point than the one keel block at the highest point of the tank; the consequence is, that a ship that is crooked when taken on that dock always continues to crook, so that the philosophy is borne out by practical results. The larger the tank the more serious the result.

Secondly. In all harbors along the seaboard, there is a swelling of the water called a *ground swell;* the action of this swell is deep. A dock formed of sections does undulate, and, even with the ordinary swell, raised by the wind acting on the upper or end tanks, causes undulation; for these end tanks must have displacement enough to keep the dock from capsizing, and, as they rise with the crown of the sea, and drop into the hollow, undulation follows as a law of nature. Again philosophy is sustained by practical experience.

Thirdly. The weight of the ship is borne on the top of the dock. The centre of gravity, therefore, is higher, by about the entire draught of the ship, than it would be if she rested on the bottom of the dock.

The mechanical objections are—

Firstly. In order to equipoise the superincumbent weight of a ship, great width is necessary; it cannot be extended, with satisfactory results, without at the same time increasing the depth of the framing, for the strength of the truss framing depends much upon the angle of the braces, truss framing depends entirely upon the bands, and they will decrease in strength about ten per cent. per annum.

Secondly. It is practically impossible to make two pumps that will exhaust the same quantity in a given time; and, if it were, it would be impossible to distribute the weight of the ship on a number of separate sections, so that she would be supported according to model or sectional weight.

Thirdly. When a sectional tank dock is sunk for a reception of a ship of the line, there will be near two thousand pounds pressure upon every square foot of surface. As soon as the pumps are set to work, they do not rise at first in the same proportion to the number of cubic feet of water discharged as at last, inasmuch as the water leaving the vessel brings the greatest weight on at first; therefore, much of air or buoyant space will be filled with the necessary braces, to enable the tanks to sustain the pressure; for, if the cavity of the tank is not supported, the hydrostatic pressure upon them when they are exhausted will cause them to contract, and again expand; when they are filled, this will cause them to leak, and, as they act separately, one may settle down, and consequently strain the ship.

Fourthly. The lifting and balancing power are entirely separate in their action; the end or balancing tanks are entirely dependent upon cog wheels; therefore, the breaking of one cog would endanger both deck and ship.

Fifthly. The sectional tank dock must draw about twice as much water, when in the operation of docking a ship, as the ship draws.

Sixthly. There are no rests for shoring a ship in the sectional tank dock; bilge chacks give but little support to the frame of a ship.

Seventhly. A tank dock cannot be coppered without using copper truss bands; for iron is soon eat out by copper, and it is questionable whether sufficient strength could be obtained by using copper bands.

Eighthly. In a tank dock, the power that lifts the dock and vessel acts first upon all sides of the tanks; they again act upon the framing. Thus the strength of tanks does not in any way assist the frames on which the vessel rests; therefore, the strength of the whole dock does not act upon the vessel in a combined form.

The above are the results of actual experiments.

JOHN S. GILBERT.

Captain B. Kennon, *United States Navy.*
Colonel S. Humphreys, *Naval Architect.*
Mr. W. R. Johnson.

D.

SECTIONAL FLOATING DRY DOCK.

Points of superiority claimed by the sectional floating dry dock over every other kind of dry dock.

1st. It presents a pliant, flexible platform, capable of being made of any required strength by trussing, which conforms, as soon as the vessel is brought to its bearing, to the shape of the keel and bottom; and, as it is upheld itself by the upward pressure of the water, it presses upon the bottom of the vessel like the water itself, affording a definite, equable, limited, and entirely controllable strain upon the various parts of the keel and sides at a great variety of points, and entirely preventing the injuries so common, and indeed unavoidable, on other docks, in consequence of the difficulty of laying the keel blocks (which must be laid by guess) upon a rigid platform, so as to be in the exact line of the keel as it floats; thus forcing it to conform to a false line, bringing the whole weight of the vessel to one point, cutting through the keel blocks, and straining the timbers and plank throughout the whole hull.

2d. It brings the vessel's bottom up fully into the light and air, instead of plunging her down, as other docks do, into a narrow, dark, wet, and unwholesome hole; and thus enables the shipwright to do the work much cheaper, better, and more agreeably, and to save all the old copper materials on its broad, clear, and well-lighted platform.

3d. It is capable of expansion and contraction, according to the length of the vessel, and is divisible into two or more separate docks, *each perfect in itself;* so that one on our plan, built for the smaller class of vessels, is adapted by simply building additional sections on to it, to be extended so as to raise the largest ship of the line—the small dock thus constituting a part of the large one, and saving the necessity of distinct expenditures for each; and, also, when built to the extent requisite for a ship of the line, the whole structure is not required, as in the stone dock and other floating docks, to take up a single small vessel, but, by its sectional arrangement, it is capable of being instantly divided into two or more separate docks or berths, to raise two or more smaller vessels at the same time, as two frigates, or one frigate and two or more vessels of an inferior class. A stone dock or a floating camel dock can take out but one vessel at a time, however small. We can take out six schooners or brigs at a time on our seven sections.

4th. Each section of our dock acts independently, yet all act in concert, to accomplish the object in hand; each section has a limited lifting power, and yields in the water as soon as that power is exhausted, if pressed beyond it, without taking or giving any additional strain; and by the arrangement of cutting up the structure into sections, and requiring each section to bear only a limited amount of strain, to which it is adapted, and making them all accomplish their work by a kind of division of labor, we are enabled, not only to make a given amount of timber and iron exert its strength in the most efficient and economical manner, but to secure it against the contingency of an overwhelming strain bearing upon any one point. Hence, we can construct our dock of great width and length without impairing its strength. Hence, also, our dock is peculiarly fitted to receive the wide and long war steamers, which, in consequence of their heavy machinery and delicate structure, it is particularly desirable to hold nearly as they float. This we are enabled to do by exhausting from the tanks of each section just as much water as the part of the steamer immediately over the section displaces when afloat; thus substituting for the one pressure another precisely equivalent. But, as the floating camel dock is an inflexible structure, it is not possible to endue it, if of large size, with sufficient strength to sustain vessels of great weight, or to sustain the strain at the ends of the upward pressure of water, if made long enough for a steamer, when a short heavy ship lies on its central portion, even with the most skilful trussing, and much less without. Neither is it possible to construct the gates of a sufficient strength to bear the pressure of a wide deep column of water, such as must press against them if large enough to admit a line-of-battle ship, as their abutments cannot be trussed, and, at best, can afford but a frail support, which must be torn away under the strain, and destroy the structure.

5th. It is easily moveable from place to place—an advantage of some moment in case of an anticipated attack on the navy yard by the enemy, inasmuch as, in such an event, the dock might be sunk in deep water, out of reach, and raised again when the danger was over, or it might be towed by steamboats to a place of entire safety. This is an advantage which our dock possesses over a stone dock, in common with other floating docks; but our sectional floating dock possesses an advantage over the camel floating dock, by being moveable in sections. In case, for instance, one should be built for the navy yard at Brooklyn, and afterwards a stone dock should be deemed necessary, and the Government should desire to send the former to Philadelphia, it could be towed in sections, through the Delaware and Raritan canal, to that city.

6th. It saves a great amount of expense in taking out a ship for repairs, the raising of the largest line-of-battle ship costing but a few dollars, and the expense decreasing as the size of the vessel diminishes; whereas, in a stone dock and camel dock, not only is the expense for a large ship greater, but it increases as the size of the vessel diminishes.

7th. It can be completed to the largest size in a few months, (not more than eight or ten at most,) ready for use; whereas it will take several years, at a vastly greater expense, to finish a stone dock; and it is believed that the interest accruing on the money that would be expended on the latter, before it could be used at all, would nearly, if not quite, pay for the former, and in addition furnish means to the Government for repairing vessels in the mean time. The result would therefore be, speaking comparatively, and supposing the floating dock to supersede, as we believe it will, the necessity of a stone dock, that the floating dock would virtually cost nothing, or, in other words, would be built by the money that would be lost in interest in building a stone dock, before the latter could be used at all, and would, in addition, furnish means of repairing vessels, of which the Government would otherwise, in the mean time, be destitute.

8th. It is easily taken out of the water in sections, to be repaired, one section being raised on two others for that purpose; but the camel dock, though much more liable than the sectional dock to get out of repair, in consequence of the immense strain on its inflexible platform, is absolutely incapable of being repaired in any manner whatever.

9th. It is entirely independent of the tides, and a vessel is raised on it equally well in high or low water.

10th. The camel dock is affected very sensibly by the undulation of the waves, though perhaps not very injuriously, being acted upon by them as the vessel itself is when lying in the water; but the sectional dock, *when occupied by a vessel*, is entirely unaffected by the agitation of the water, and must necessarily be so by the very laws of nature. Let us suppose a vessel raised on it, *wholly above the surface of the water*, with the lifting structure beneath it, by displacing a quantity of water precisely equal to the weight of the vessel, it is apparent that the platform, with its tanks, lies in the water precisely as if it was what is technically called *waterlogged*, its whole buoyant power being exhausted by upholding the vessel; the timbers that connect the sections, being keyed as soon as the vessel is raised, cannot move separately any longer, but become one firm structure; and the swell of the harbor, which never ruffles the water to half the depth occupied by these *quasi* waterlogged sections, washes harmlessly over them, and instantly dies against them, for want of water to supply its action in the space now occupied by the timbers and tanks; and the end floats are equally unaffected by the swell, because, though their buoyancy is only in part exhausted, and they lie on the water only slightly pressed therein, yet each acts like a lever at each end of each section, with the vessel's keel as a fulcrum, counteracting each other, if acted on extraneously by the swell or any other disturbing force, and each instantly resisting any disturbance the other may be exposed to receive. It is a fact that, during the heaviest gales, vessels have uniformly lain on the sectional dock without the slightest motion, or the least variation of the masts from a vertical line, and confessedly safer than at a solid pier.

11th. Our company have extended their structure to seven sections, of 300 tons each, making a lifting power of over 2,000 tons, and more than double that of any other elevating dry dock in the country, and capable of raising a frigate even now; and in case the Government adopts our plan, the Navy Department could be prepared, as soon as they have completed two or three sections, by union with five or six of our sections, which could be easily effected, to take out a 74-gun ship.

12th. Ours is the only floating dry dock that has ever been practically extended to a capacity of raising vessels of the first class, and it is the only one that has been absolutely known experimentally to have succeeded on a large scale.

13th. In case of a leak springing in our dock, it is not probable that this could happen to but one section at a time, (and it has never yet occurred in our dock at all,) and there is always reserved power enough in the others to dispense with one altogether; so the result would therefore be, that, in case the leak could not be stopped or counteracted by pumping, the sections being all keyed together, and the water remaining in the other tanks being pumped out, the power lost is immediately supplied, and the vessel is kept in position. In the camel dock, if a leak should occur beyond the capacity of the pumps to counteract, the whole structure must inevitably sink.

It is to be remarked, that the platform which supports the vessel, and which constitutes about seven-eighths of the cost of the whole structure, is constantly under water, and is consequently almost imperishable; and the work is so framed that the timbers and fixtures above the water can be supplied when decayed, and easily affixed to the platform.

It is to be remarked, that this sectional dock has been in constant and successful operation for nearly two years, and the register of the dock exhibits a list of several hundred sailing vessels and steamers which have been repaired on it during that period without the slightest accident or injury either to the dock or a vessel in a single instance—a fact which presents the best possible evidence of the safety of the dock.

It is also to be remarked, that the steamboats Albany and De Witt Clinton, which are about 64 feet wide and about 300 feet long, were raised recently on six sections of this dock, and their owners (Mr. Stevens and Mr. Dunlap, themselves skilful mechanics and sound practical men) most unhesitatingly declare that, though they never before had those boats raised without serious strain and injury, they were taken out by our dock without the slightest strain or injury, even to the most delicate fixtures.

We can appeal most confidently to nine-tenths of the shipwrights in the city, and to *all* who are not interested directly or indirectly in the old-fashioned plans of dry docks, for confirmation of our claims to superiority over other plans of dry docks, and to sustain us in every position above taken on the subject.

L. D. DAKIN.

E.

John S. Dakin's letter relative to the cost of constructing a site for a floating dock, &c., at Brooklyn, Long Island.

NEW YORK, *October* 4, 1842.

GENTLEMEN: I am authorized by Messrs. Campbell & Moody, a very respectable and responsible firm in this city, to say to you that they are ready to contract with the Government to excavate a berth or location for a sectional floating dry dock, on our plan, at the navy yard at Brooklyn, any where in the vicinity of the proposed location of the stone dock, to the depth of 40 feet, in every respect adequate to work a dock of 5,500 tons capacity, for the sum of *four thousand* dollars; and also to build two piers, one each side of the excavation, with a crib of stone abutment at the end of each, and each thirty (30) feet wide, and 250 feet long, and similar in construction to the piers on the East river in New York, for four thousand five hundred dollars each, with a protecting boom in front, and with close piles driven at the sides, to prevent the influx of the mud.

Under these circumstances, I am ready, in behalf of our company, to contract for the said excavation and piers at the same rate, and to agree that the whole cost of berth, piers, and location, in every respect adequate for working the dock at Brooklyn, for the sum of thirteen thousand dollars.

This proposition is made upon thorough examination of the proposed location, and accurate calculations of the expenses; and we are fully prepared to make this a part and parcel of our proposals to Government.

I would add, also, that should the Government purchase the small gore of land between Jackson street and the navy yard, as has been contemplated by the Secretary of the Navy, it will afford a location for the dock, with abundance of water, without any dredging; and the current of water at that point will always preserve the requisite depth.

Respectfully, yours,

S. D. DAKIN.

Messrs. KENNON, HUMPHREYS, and JOHNSON, } *Commissioners, &c.*

[Here follows diagram, marked F, in the original.]

G.

Description of a floating pneumatic dry dock, by Peter Von Schmidt.

The elevating power of this dock consists in a series of submerged air-chambers of a square (or they may be cylindrical) shape, underlying the whole frame work, and so connected with it as that each separate chamber may be detached and withdrawn for repair, at pleasure, the cubical contents of the whole exceeding the amount of the displacement of water by the dock itself, and the vessel to be raised, by such an amount as will ensure the dock and vessel against all ordinary contingencies.

These chambers are air-tight, excepting at the bottom, where are one or more holes to each, for the admission and discharge of water, and of a size sufficient for the easy entrance of a man. They are designed to be constructed of four-inch stuff on the top, three-inch stuff on the sides, and two-inch stuff at the bottom, each side bolted together, through and through, with iron rods of $\frac{5}{8}$ inch diameter, (or $\frac{3}{4}$-inch copper rods, as may be preferred;) both ends of the rods are countersunk, and covered with prepared wooden plugs, or other suitable material, for cutting off the access of the water. The stuff of which the chambers are made is all charred, and impregnated with a preparation that will effectually secure the wood against the attack of the worms, and also its greater durability. The connecting rods are placed at intervals of every four feet; whilst at the intermediate central distances the chambers rest against the timbers of the dock, so that they are supported at intervals of every two feet. The lines of chambers run transversely of the dock. In each line are six chambers, each of 33 feet length, 10 feet width, and 5 feet depth, from out to out.

There are also on each side of the dock six upright elevating cylinders, (or square chambers may be used instead,) the top of which is on a level with the upper frame work, and the lower extremity of which is entirely open—extends to the lower tier of the timbers.

They are of eight feet diameter in the clear, and serve as elevators, in the same manner as the submerged air chambers.

There are also air-tight supporting cylinders (or square chambers may be used instead) between the upright elevating cylinders, which always lie on the surface of the water, and, when the dock is raised, are fastened in their places by cross-timbers. They serve to prevent the dock from rolling, by the action of the winds or waves. The ballast (which may most conveniently be of large stone) is laid upon the outward part of the frame work, or on the top of the air chambers. This plan is adopted instead of ballast boxes, as originally designed, and as in the model exhibited to the commissioners in New York, in order to save the space occupied by the boxes for elevating purposes.

For raising the dock, air is pumped into the submerged air chambers and the upright cylinders, through copper tubes of suitable dimensions, by means of a steam engine, working one or a dozen air pumps, as may be desired. Each tube connects with a series of chambers, and is supplied with two cocks, one for admitting and the other for discharging the air; and there are valves so arranged as to cut off the passage of air from one series of chambers to another. The air pumps, the cocks, &c., are all in the engineer's room on the top of the dock, subject to his sole use, always secured against the action of the elements.

The dock is constructed principally of small timber, so framed, braced, and fastened with bolts, (to be of copper under the water lines,) as to be capable of resisting any strain to which it would be liable. That part of the frame on which the vessel rests is put together so firmly that the dock will not be liable to settle in the centre. The frame work all being open, neither high winds nor a heavy sea would cause it to rock, so as to endanger a vessel on the ways.

When a vessel is floated into the dock, she is adjusted so as to bring her keel to the centre, by means of wires or cables stretched across the frame work, and attached to it, with the centre marked upon them. She is then secured in her position, by fastening these wires or cables suitably to her when the dock is raised.

There are permanent keel blocks for the two extremities of the keel first to rest upon. As soon as these are touched, the admission of air is shut off, and sliding keel blocks, wedged-shaped, are then drawn from each side by means of chains or ropes, and windlass, at intervals of every four feet; so that the ship rests upon her keel, maintaining her form as when afloat. At the same time the shores, which also move in slides by means of chains and windlass, fastened by ratchets, are drawn up to the vessel. The raising is then completed.

The shores are constructed of permanent frame work, and projecting therefrom are scaffold timbers. On these the necessary plank can be laid, without loss of time, and work proceed on the whole bottom simultaneously.

In the engineer's room are spirit levels, which indicate the position in which the dock is rising, and which will govern him in the admission of air into any series of chambers. In like manner, they serve to regulate the sinking of the dock.

The capacity of the dock, for which the accompanying estimates and proposals are made, is given on the estimates.

In the event of war, a disabled vessel could be taken out of harm's way by this dock, with little liability to injury itself. Twenty chambers might be injured by shells or balls, without materially affecting its sustaining power.

Three hands would be sufficient to attend a dock of the largest size, viz: an engineer, an assistant to attend the cocks, and a hand to manage the keel blocks and shores.

The dock can be built and ready for use in six months.

This dock, being one solid structure, will not subject a vessel to strain by its own action.

An advantage claimed in the use of air pumps is, that they are not as liable to derangement as water pumps, nor to freezing in the winter season.

No time is lost by this dock in the erection of scaffolds.

Abundant open space is afforded around the ship for the employment of a large number of hands, where great speed is required, and also for managing bulky timber, where repairs requiring it are needed. This will be distinctly perceived on reference to the drawing.

The width of the dock is such that the centre of gravity of the whole mass is brought so near to the surface of the water that there can be no danger of capsizing. In addition to this, the supporting cylinders at the sides, which are only brought into action by a side inclination of the dock, serve to increase the improbability of such an occurrence.

With regard to the material use for impregnating the submerged timber and planks, satisfactory evidence will be given to the commissioners of its efficacy to the end proposed, on their application.

It is not perhaps necessary, at this time, to divulge the information. It is proper, also, to say that, in charring the surface of the timber and plank, the process employed is such as to accomplish this object without the least possibility of damage to the mass.

PETER VON SCHMIDT.

New York, *October* 6, 1842.

H.

Mr. Von Schmidt's description and estimates for his dry dock.

	Pounds.	Cubic feet.	Tons.	Dollars.
WROUGHT IRON, at $12\frac{1}{2}$ cents per pound, work included.				
132 hoops for 12 cylinders; each cylinder to be 40 feet long, 8 feet diameter in the clear; every 4 feet a hoop, or 11 hoops to a cylinder; the iron to be 2 inches wide, and $\frac{1}{2}$ inch thick; each hoop in three parts, connected by wedges.				
Formula: $324'' \times 2'' \times 0.5'' \times 11 \times 12 \div 1{,}728 \times 480$ lbs. $\times$ 12.5 lbs. - - - - -	11,856	24.7	5.9	1,482 00
12 iron-head bars.				
Formula: $114'' \times 2'' \times 0.5'' \times 12 \div 1{,}728 \times 480 \times$ 12.5 cents - - - - - -	360	0.78	0.18	45 00
160 hoops to 16 support cylinders, 10 hoops each; dimensions as above.				
Formula: $324'' \times 2'' \times 0.5'' \times 10 \times 16 \div 1{,}728 \times 480$ $\times$ 12.5 cents - - - - - -	14,400	30	7.2	1,800 00
32 head bars.				
Formula: $114'' \times 2'' \times 0.5'' \times 32 \div 1{,}728 \times 480 \times$ 12.5 cents - - - - - -	1,008	2.1	0.5	126 00
40 ratish bars to keep the scaffolds; shores, stationary, 15 feet each.				
Formula: $180'' \times 3'' \times 1'' \times 40 \div 1{,}728 \times 480 \times 12.5$ cents - - - - - - -	6,000	12.5	3	750 00
40 ketsher to the ratshes.				
Formula: $12'' \times 3'' \times 3'' \times 40 \div 1{,}728 \times 480 \times 12.5$ cents - - - - - - -	1,200	2.5	0.6	150 00
1,000 screw bolts $\frac{5}{8}$, to scaffold shores.				
Formula: $6'' \times 0.3068'' \times 1{,}000 \div 1{,}728 \times 14$ cents	508.8	1.06	0.25	70 23
1,404 screw bolts $\frac{5}{8}$, to the upper part of boxes.				
Formula: $120'' \times 0.3068'' \times 1{,}404 \div 1{,}728 \times 480 \times$ 14 cents - - - - - -	14,352	29.9	7	2,009 28
2,808 screw bolts to the sides of same boxes.				
Formula: $66'' \times 0.3068'' \times 2{,}808 \div 1{,}728 \times 480 \times 14$ cents - - - - - - -	15,888	33.1	7.9	2,224 32
Total wrought iron - - - - -	65,572.8	136.61	32.53	8,656 88
COPPER, at 30 cents per pound.				
2,862 screw bolts $\frac{5}{8}$, to connect framing.				
Formula: $6'' \times 0.3068'' \times 2{,}862 \div 1{,}728 \times 544 \times 30$ cents - - - - - - -	1,632	3	0.8	489 60
1,762 screw bolts on main timber, 1 inch dist.				
Formula: $9'' \times 0.7853'' \times 1{,}762 \div 1{,}728 \times 544 \times 30$ cents - - - - - - -	3,916.8	7.2	1.9	1,175 00
621 screw bolts, to connect upper and lower sleeper, 1st.				
Formula: $84'' \times 0.7853'' \times 621 \div 1{,}728 \times 544 \times 30$ cents - - - - - - -	12,892	23.7	6.4	3,867 84
648 bands on main timber.				
Formula: $72''$(average) $\times 2'' \times 0.5'' \times 648 \div 1{,}728$ $\times 544 \times 30$ cents - - - - -	14,688	27	7.3	4,406 40
540 screw bolts $\frac{5}{8}$, to fasten the box sleepers to the joists.				
Formula: $18'' \times 0.3068'' \times 540 \div 1{,}728 \times 544 \times 30$ cents - - - - - - -	941.1	1.75	0.47	282 33
Total copper - - - - - -	34,069.1	62.63	16.87	10,221 18

H—Continued.

TIMBER.	Cubic feet.	Square feet.	Dollars.
156 boxes, each 33 feet long, 10 feet wide, and 5 feet deep; the upper plank 4″.			
Formula: 33′×10′×4″×150×4 cents - - -	16,500	198,000	7,920 00
Formula: 10′×198×3″×26×4 cents, 3″ thick, (side plank) - - - - - - -	9,646	154,440	6,177 00
Formula: 10′×198×2″×26×4 cents, bottom of boxes	8,586	102,960	4,118 40
312 heads of said boxes.			
Formula: 10′×5′×3″×12×26×4 cents - -	3,900	46,800	192 00
12 upright cylinders, open below, 40′ long, 8 feet diameter in the clear, 3 inch staff.			
Formula: 26.7×3″×40×12×4 cents - - -	3,204	38,448	1,537 92
12 cylinder heads.			
Formula: 26.7×2.125×3″×12×4 cents - -	160	2,042.5	81 70
16 sup. cylinders, 25′ long, dimensions as before.			
Formula: 26.7×25×3″×16×4 cents - - -	267	3,204	1,281 64
32 cylinder heads.			
Formula: 26.7×2.125×3″×32×4 cents - -	453.8	5,446.7	217 84
Main timber, 2.5 (average width) by 6″.			
Formula: 198′×2.5×6″×27×4 cents	6,682	80,190	3,207 60
Upper sills, 12 to be 198′ long, and 15, 182 feet.			
1st formula: 198′×1′×6″×12×4 cents	1,187	14,256	570 24
2d formula: 182′×1′×6″×15×4 cents - -	1,365	16,380	655 20
Lower sills, 198′×0.5×6″×27×4 cents - -	1,336	16,038	641 00
Timber in upper frame work.			
Formula: 314′×6″×3″×12×4 cents - - -	471	5,652	226 08
Formula: 264×6″×3″×15×4 cents - - -	495	5,940	237 60
Formula: Posts, 1,903′×0.5′×3″×27×4 cents -	6,422	77,071	3,082 86
Formula: Bracing, 1,200′×4″×3″×27×4 cents -	2,700	32,400	1,296 00
Formula: Keel beam, 260′×2′×1′×4 cents - -	520	6,240	249 60
Formula: Upper sleepers, 260×9″×4″×48×4 cents -	3,120	37,440	1,497 60
Formula: Lower sleepers, 260×0.5×4×23×4 cents -	996	11,960	478 40
Connecting timber.			
Formula: 260×0.5×3″×42×4 cents - - -	1,365	16,380	655 20
Formula: Lengthwise bracing, 698×0.5×3″×12×4 cts.	1,047	12,564	502 56
Iron between frame work.			
Formula: 6,240×0.5×3″×4 cents - - - -	780	9,360	374 40
Keel shores, every 4 feet.			
Formula: 1.5×45×9″×4′×4 cents - - - -	202	2,430	97 20
Formula: Shore frames, 90×0.5×3″×12×4 cents -	135	1,620	64 80
Formula: 1st scaffold shores, 421×0.5×3″×44×4 cents	2,315	27,786	1,111 44
Formula: 2d scaffold shores, 195×0.5×3″×44×4 cents	107	12,870	514 80
Formula: — sleides frames, 90×0.5×3″×50×4 cents	56	6,750	270 00
	74,017.8	993,489.2	37,258 42
Add 75 per cent. for work - - - - -	-	-	27,943 81
Total timber and work - - - - - -	-	-	65,202 23

RECAPITULATION.

Iron and work, 32.53 tons	$8,656 88
Copper and work, 16.87 tons	10,221 17
Timber for work, 993,489 square feet	65,202 23
	84,080 28
Copper pumps, cocks, and valves, &c.	2,000 00
Steam engine	5,000 00
	91,080 28
Add 10 per cent. for contingencies	9,108 02
Total	100,188 30

The total weight of the dry dock in air:	
Timber	1,263.6 tons.
Copper	16.87 "
Iron	32.53 "
Steam engine and supose	10 "
Total dry dock	1,323 tons.
Weight of a ship of the line	5,500 "
	6,823 tons.
Loss in weight of such parts of the dry dock which are constantly immersed	1,210 "
	5,613 tons.
Capacity of dry dock	7,117 "
Surplus power	1,504 tons.

PETER VON SCHMIDT.

New York, *October* 6, 1842.

I.

Letter from Mr. W. A. Cox, engineer, relative to the construction and use of Schull & Martin's dock.

New York, *October* 5, 1842.

Gentlemen: At the interview afforded me this morning to explain the floating dry dock of Messrs. Schull & Martin, you were pleased to say that any communication which we might desire to make would be received by you, and laid before the Department. I beg leave, therefore, to offer the following brief statement of the dimensions, properties, &c. of a dock upon this plan, suitable for the use of Government, and divested of the railway, cradle, and other parts connected with it, for the purpose of taking the vessel on land:

1. A dock capacious enough to take up a Government steam ship will be—

Length 226 feet 6 inches, or 13 floats each, (with its truss framing,) being 17 feet 3 inches, and one additional truss at end; say 17 feet 3 inches $\times$ 13 $+$ 2 feet 3 inches $=$ 226 feet 6 inches. Width in the clear, 68 feet.

Depth from bottom of truss frame to top of keel blocks, 19 feet 6 inches.

2. The external dimensions of the dock will be—

Whole length required for shafting and machinery, 231 feet 6 inches; whole width occupied by floats and framing, 93 feet; say 68 feet for width in the clear + 12 feet 6 inches on either side for upright posts and machinery, = 93 feet.

Whole depth, 48 feet; say depth of tanks, &c., as before, 19 feet 6 inches, + draught of water of the North Carolina, 25 feet, + 2 feet for rise of dock above water, + 1 foot 6 inches additional height of piers for spring tides, = 48 feet.

Note.—Any extent of solid piers beyond the dimensions here given will be needed only for strength, and may be occupied for any other purposes than those of the dock.

3. The lifting power will be 5,200 tons; say 13 floats or tanks, each lifting 400 tons, = 5,200 tons. Subsidiary to this, the dock possesses an almost *unlimited* lifting power, by means of the racks and pinions against the upright posts—a power which we can render available and safe by proper transverse trussing, and pauls and racks, upon the upright framing.

4. The number of hands required to work the dock will be—

1 engineer,
1 fireman,
2 extra hands, = 4 in all.

5. The quantity of air in each tank, and consequently its buoyant power, is indicated in every stage of lifting a vessel by a rod rising from the tank, with an index upon it, and a graduated scale upon the frame work of the dock. The line of the ship's keel is ascertained by a system of levers with indices and graduated scales, before any attempt is made to lift her. The ship is centred by the keel, instead of shores above the water line.

The keel blocks are so constructed that they can be made to conform to the line of the keel, in the event of its having received any injury, or if the vessel is hogged or broken-backed. The upward pressure of the tanks does not therefore tend to strain the vessel in any part. The machinery which works the pumps is arranged with a view to produce the least possible strain upon the frame work of the dock.

In conclusion, I would add, that every accident which experience has shown floating dry docks to be liable to has been provided against in this one, as far as our knowledge of materials and the best mode of employing them has permitted. The advantage of placing a dock possessing the least possible mobility in such an exposed situation as the navy yard at Brooklyn does not need to be expatiated upon.

A specification of the particular mode of building the dock, the materials to be employed, and an estimate of its cost, will be forwarded to the Department at the earliest possible moment. Lest any erroneous impression with regard to the cost of the dock should be created by the estimate I named this morning, I would remark that that estimate related to a dock (not coppered) sufficient only to raise a merchantman of 1,000 tons burden.

I am, gentlemen, very respectfully, yours, &c.

W. A. COX, *Engineer.*

Com. KENNON,
Col. HUMPHREYS, and
Professor JOHNSON,
} *Commissioners, &c.*

K.

Mr. John Thomas's letter, relative to the draught of water required on his plan, in order to take up a ship of the line, and on the effect of docking the Pennsylvania.

City of New York, *October* 1, 1842.

Sir: The following are a few remarks, relative to floating and stone wall docks, which I shall feel greatly obliged if you will lay before the board of commissioners having this subject under consideration.

I would first remark that, if the Pennsylvania was taken on my floating dock, with all her guns, men, and stores, for six months, her weight, 4,000 tons, and her draught of water, 25 feet, to give my dock sufficient capacity, I should have to increase my depth from six to nine feet; this would give me eight feet of lifting power. I should then have, on seven sections, 4,375 tons, added to that 300 tons, the lifting power of my floating wharf, which would make, in all, 4,675 tons; I should require 34 feet of water. At slack water, by the aid of a steamer, my dock could be placed and anchored where 34 feet of water is to be found. I could then take the Pennsylvania on. I would place three wale shores on each section, and back the main cleats over the heads of said shores with two smaller cleats. I would secure the floor heads with ten bulge blocks on each side. From this it may be seen that she would be supported by 34 keel blocks, 20 bulge blocks, and 42 wale shores, making in all 97 points of bearing. Thus the ship would be completely cradled, as soon as the water had left her load-water line one inch. At the slack water the next tide, with the aid of said steamer, I would take her alongside of the yard in eight feet of water, and the ship secured beyond the possibility of straining.

I will now show what can be done in the stone wall dock at Gosport, Virginia. There are 26 feet of water on the gate sill of this dry dock; if it should be found that 22 feet of water is the depth on the sill of the gate, then my dock at 6 feet will be the same capacity as the Gosport dock, because each will require to have three feet added to its depth. Supposing the dock to have 25 feet of water, let us see what is to be done with her when placed in the dock. I suppose the Pennsylvania to be as strong a ship as any in the world, and that her keel has an upward curve, or aged, not more than four or five inches; this is less than any long ship I have ever known. I suppose the ship placed on straight blocks against her wales, which is all that is usual, until the water is drawn from the dock; then bulge shores are placed at the shore heads, and at various other parts, as the superintendent may think proper. It is impossible to place bulge shores, or vertical wale shores, until the ship's keel is firmly fixed on the blocks, so that the whole weight of the ship, and all that is in her, must rest on the keel. The weight of the projecting sides would rest on the floor timbers, and, their only bearing being on the keel, must strain them exceedingly. The Pennsylvania is yet perfectly sound, and might bear the strain; but, if attempted in ten years' time, it is not improbable but that her floors would break in the middle, and her bottom fall out in the dock. If my opinion was asked what I thought should be done with said ship if she should return into port in a very leaky state, I would recommend that the ship be run on the mud, then dismantled, and every thing taken out of her, and then put in the dry dock.

From the remarks I have made, I think it may be seen that, if ever the experiment is made, the ship will not be strained on the floating dock, and much strained on the stone dock.

I remain, sir, with great respect, your most obedient servant,

JOHN THOMAS.

Captain KENNON, *U. S. Navy.*

L.

Notes by Captain M. C. Perry, relative to the depth of water at the Brooklyn navy yard.

Width of channel, which may embrace a depth of 26 feet when excavated, say 200 feet; 80 feet of this width has been excavated; the remaining space may vary in depth at half tides, say from 17 to 22 feet.

The natural channel, before the excavations commenced this spring, varied in depth from 17 to 26 feet. There was not width to wind a line-of-battle ship.

M.

Statement presented by Mr. Dakin of interest lost in building an excavated stone dry dock before it can be finished ready for use.

Suppose the cost to be only $1,200,000, though Mr. Rhodes is of opinion that at Brooklyn the cost will be considerably more. The shortest time within which any one supposes it could be finished is 6 years, which makes an expenditure of $200,000 a year. The Government now pays 7 per cent. for money, and must probably do so for some years.

At the end of the first year after the expenditure of $200,000, say one-half of it expended the first 6 months, the interest at 7 per cent., 1 year, on $200,000, and six months on $100,000, is -	$17,500
At the end of second year interest on $400,000 one year, and $100,000 6 months, is - - - - - - -	31,500
Third year $600,000, and $100,000 6 months, is - - -	45,500
Fourth year $800,000, and $100,000 6 months, is - - -	59,500
Fifth year $1,000,000, and $100,000 6 months, is - - -	73,500
Sixth year $1,200,000, and $100,000 6 months, is - - -	87,500
Total - - -	315,000

Add to this the extra expenses the Government would be exposed to in various ways, in consequence of having no means of raising vessels at Brooklyn during this six years, and it will probably be sufficient to construct a floating dock for the Pennsylvania, with full armament, leaving the *convenience* of having the dry dock within six or eight months, instead of waiting six or eight years—a *clear saving* over and above all the rest of the gain of building the floating dock out of the *losses* attending on building the stone dock, *exclusive* of its gross expense. It is also to be observed that the interest on the cost of a stone dock, which is say $70,000 per annum, will build a floating dock of the largest size every six years or thereabouts.

The above estimates do not take into consideration the superior facilities afforded to the workmen on the floating dock, which enable them to do the work 15 to 20 per cent. cheaper than on the stone dock, nor the great saving of old copper materials lost on other docks, nor the great advantage, afforded *only* by the sectional dock, of being enabled to raise two or more vessels at a time, and doing simultaneously twice, or more, the actual work that can be done by any other dock.

It is worthy of consideration, also, that it is very doubtful whether the two vessels now laid up at the Brooklyn yard can wait for the completion of a stone dock, and would not, in fact, be ruined before that time.

N.

Mr. John S. Gilbert's notes on the weight and displacement of his dock when afloat.

		Weight of materials. Cubic foot.
Round stone	lbs.	160
Sea water		64
Oak timber		60
Price		30
Iron		486

Displacement of the dock, 615 tons to a perpendicular foot.

120,000 cubic feet of timber to build the dock. This timber is made as heavy as water by adding ballast; each cubic foot of timber is made to weigh 64 pounds; weight of dock, 3,840 tons when ballasted.

Washington, *October* 27, 1842.

Sir: The undersigned have, agreeably to your request of yesterday, examined the model of a floating dry dock, presented to the consideration of the Department by Messrs. Starkweather & Tallmadge, accompanied by Mr. Cox, the gentleman with whom we had some communication on the same subject in New York. For our remarks on the principles of Messrs. Schull & Martin's dock, which is in fact the one now under consideration, we beg leave to refer you to the statement contained in the sixth article of our report, under date of the 8th instant. The objections to this form of dock, on account of the great depth of water required, the necessity of deeply founded and permanent stone piers, to be laid in cement, and consequently the probable demand of coffer dams to secure their foundations, and of the gates or aprons to exclude the influx of mud, must be regarded by us as still existing in full force, especially since the estimate, mentioned by the gentlemen themselves ($500,000*) as the cost of a dock to receive ships of the line,

* A subsequent offer, in writing, was made at $450,000.—S. H.

is, if we are not misinformed, more than half, if not more than two-thirds, the cost of the permanent walled dock at Charlestown navy yard. One objection mentioned by us in the report before referred to, namely, that arising from the employment of machinery to elevate and depress the dock, and the inconvenience and derangement likely to arise from the great strain to which the rise and fall of the tides would subject such machinery, has been sought to be obviated by the engineer, by allowing the machinery to play in obedience to the rise and fall of water. If this principle be applied, it will require additional parts of machinery to adapt it to this purpose; it will require more buoyant power in the tanks to set the machinery in motion on a rising tide, and to lift the ship, than would be necessary for the latter purpose only, and on a falling tide a part of the weight of the vessel would be employed in overcoming the friction of the train of wheels, pinions, &c., and consequently she would not sink so low as the tide fell, nor rise as high as the tide rose, by the difference due to the friction in both cases. The water must consequently be nearer the keel in one case than the other; and whether this would occasion serious inconvenience or not must depend on the accuracy with which the machinery worked. That a train of shafts, wheels, pinions, and racks six hundred and thirty feet in length, may be made to act in unison, is unquestionably true, but that it would have the simplicity, ease of repair, and general permanency of the machinery in an excavated and walled dock, or even of some forms of floating dock, we are by no means prepared to admit. The arguments which were used in the interview which we had with the proprietors of this dock, to convince us of the want of title to the plans used by some of the parties in New York, we do not conceive it necessary for us to dwell upon, as the question of ownership obviously belongs to other tribunals.

With the above views, we do not feel authorized to recommend this plan for the adoption of the Department.

All which is respectfully submitted by

Your obedient servants,

BEVERLY KENNON,
Captain U. S. Navy.
SAMUEL HUMPHREYS,
WALTER R. JOHNSON.

Hon. A. P. Upshur.

New York, *October* 28, 1842.

Dear Sir: I wish the following additions and modifications to be made to the proposals heretofore submitted by me for building a sectional floating dry dock for the United States navy, viz:

1st. I propose to build each section according to the plan and drawings submitted a few days since to the Department, both as to the general dimensions and as to the size of the particular timbers, and all the details of the structure to be satisfactory in every respect.

2d. I propose to cover all parts of the timbers, tanks, and floats, exposed to the action of salt water, with zinc of satisfactory thickness.

3d. In my proposition already submitted, I did not contemplate an extension of the structure beyond 4,500 tons; but, having learned that the

Pennsylvania, fully armed and loaded, weighs 5,200 tons, and that it may be deemed expedient to enlarge the dock to that capacity, which could be done without much additional expense, as it is not so great an extension as to require an additional section, I propose to furnish the dock complete, including zinc sheathing, with a *clear* lifting power of 5,300 tons, applicable to raising vessels, for the sum of $400,000; or to furnish the same, complete as aforesaid, with a clear lifting power of 2,650 tons, sufficient to raise an eighty-gun ship, unloaded and unarmed, for $200,000.

4th. I propose to keep the structure *perpetually* in repair, if desired, for the use of it, when not actually wanted for Government vessels, holding it at all times ready to be surrendered to the Government on a few hours' notice.

5th. I propose, with the money *already* put at your disposal by Congress for this purpose, to provide means within six months, by building three sections, to act in conjunction with our establishment, to raise the two ships of the line, Franklin and Washington, now lying in the water at Brooklyn, which, if neglected a year or two more, and long before a stone dock could be built, will be utterly ruined and beyond the reach of repair, but, if raised and taken care of, now are worth to the Government at least four hundred thousand dollars.

Very respectfully, yours,

S. D. DAKIN, *President, &c.*

Hon. A. P. Upshur,
Secretary of the Navy.

Washington City, *October* 29, 1842.

Gentlemen: The undersigned, in behalf of themselves and associates, propose to construct a floating dry dock for the Government, agreeably to the annexed specifications and drawings, herewith delivered, for four hundred and fifty thousand dollars.

In point of durability, this dock is not essentially, if at all, inferior to the wall dock, is as easily repaired, can be worked more expeditiously and at much less expense, and, having full confidence in its stability, we are willing to guarantee it to the Government, in this particular, by the most satisfactory security.

Shall the Government wish a dock of smaller dimensions for sloops of war, and we will construct the same at a price corresponding with its capacity; and, in the event of our undertaking a dock, we shall be pleased to prosecute the same under the supervision of a competent officer, to be assigned by the Government.

Respectfully, yours, &c.

HENRY F. TALLMADGE,
S. STARKWEATHER,
WM. A. COX.

Messrs. Kennon,
Humphreys, and
Johnson,
Commissioners, &c.

PHILADELPHIA, *October* 11, 1842.

SIR: In drawing up the report of the commissioners on the subject of floating docks in New York, there was felt the want of an opportunity to consult certain reports on the same subject, made as long ago as 1826.

Having, since my return to this city, referred to the proper publications, I have made the accompanying copy of an able report to the Franklin Institute, which, as it sustains many of the views of the commissioners, and as it emanated from gentlemen amply qualified to understand and explain the subject, seems to me entitled to a place among the documents now in the Department on the subject of floating docks.

I have subjoined references to other published reports relative to floating docks and marine railways.

I remain, very respectfully, your obedient servant,

WALTER R. JOHNSON.

HON. A. P. UPSHUR,
Secretary of the Navy.

[From the Franklin Journal, vol. 3, page 3, January, 1827.]

Report of a select committee, appointed by the Franklin Institute, on a dry dock projected by Commodore James Barron, and also one by Captain Thomas Caldwell.

The committee appointed by the Franklin Institute, of the State of Pennsylvania, to examine the plan of a dry dock submitted for examination by Commodore James Barron, of the United States navy, and of another dry dock submitted by Captain Thomas Caldwell, report:

That the immense importance of dry docks to the people of this great commercial nation has induced the committee to delay the presentation of their report, in order that a thorough investigation of the merits and defects of the various plans now in operation, and those now proposed to the Institute, might be effected.

The United States present the only instance existing of a great commercial people destitute of dry docks for building, coppering, examining, cleaning, and repairing their national and commercial marine.

The large ships of war of the nation are at present suffered to decay when serious repairs are requisite, which might easily be performed if dry docks were in existence in the Union.

The danger and expense from this neglect require immediate attention, and the national welfare demands the establishment of docks without further delay. The system adopted by our merchants, in heaving down vessels of large dimensions, when repairs are required, is at once expensive, dangerous, and incomplete; expensive, for it requires the removal of their cargoes, and of many articles from the ships, to qualify them to sustain this severe and straining operation, whilst much time is lost and much labor expended in the processes subsequent to the heaving down, as well as in the preliminary operation; dangerous, as the violent and unavoidable straining of the timbers, bolts, copper, &c., must weaken and injure the vessel; incomplete, as thorough repairs cannot, in many cases, be performed, and as the injury done cannot always be completely ascertained perhaps not until danger in a storm at sea reveals the extent of the evil, when discovery is almost unavailing, from the impossibility of then repairing the damage. For all these reasons, your committee most strongly condemn this process.

Our merchants, aware of these facts, are sometimes compelled to send their vessels to the dry docks of Europe, when coppering or serious repairs are requisite. The necessity of employing the ship builders of foreign and sometimes hostile nations, (with whom intercourse may be interrupted by national disputes,) and particularly our thus depriving of employment our own ingenious and skilful ship builders and mechanics, who are now frequently unemployed for a portion of every season, and whose labor is therefore lost to the nation, all dictate the necessity of a change; for it cannot be doubted that, if dry docks existed in the ports of our country, all the operations of building and repairing vessels could be performed here with *more economy* and with *greater despatch*, with *equal excellence* and with *far greater convenience*, than at present.

Many of these advantages will, in a comparative degree, be experienced by such ports in our country as may adopt docks over such as are destitute of these highly important structures.

The committee consider it foreign to the object of their appointment to express any opinion in relation to the railway docks which have been recently constructed in the United States.

Previously to commencing our examination of the comparative advantages of the plans now submitted to us, we will describe those which have been heretofore in use.

The dry docks employed in Europe resemble, in their structure, the larger class of locks which are used on canals; but they are usually far more expensive to construct, in proportion to their relative magnitude. Necessity frequently requires their location in a marshy or loose soil; the dock pit must be excavated to a great depth, frequently much below the surface of the adjoining harbor; much caution and labor are requisite to exclude or remove the water from the excavation. To prevent accidents from the adjacent earth slipping in, and thereby injuring or retarding the works, it is frequently necessary to allow a considerable slope to the sides of the dock pits; consequently, much labor is expended in the excavation. Many piles, driven to a considerable depth, are required, the masonry demands much labor to ensure durability, and hydraulic cement is indispensable. Stone dry docks are consequently very expensive structures; $75,000 or $80,000 being the least estimate which can be relied on for the cost of a dock,* including the appurtenances, calculated for vessels of 300 or 400 tons, and a larger sum for ships of greater magnitude.

A dock of this description could not be completed in less than one, and would, probably, require two years. The interest of the capital employed in constructing the work (which is unproductive during this period) will of course add to the above expense, and, should no *delay* take place in *commencing* the docks, our shipping must inevitably suffer during the above period of time.

When stone docks are well constructed,* few repairs are required; if, on the contrary, the plan or the structure be defective, much time, much de-

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*The above estimate is calculated for the vicinity of Philadelphia; land, workshops, sheds, and other buildings, are not included in it.

lay, and great expenditure of money, may be required to maintain them in repair or to remedy their defects.

When the height of the rise and fall of the tides is greater than the draught of the shipping, for which the docks are constructed, steam or other engines, applicable to pumps, are not required to remove the water; but, with the exception of the extreme northeastern coast of the United States, the maritime districts of our country will require docks in which pumps will be indispensable. The engine employed must be sufficiently powerful to perform this operation with expedition.

In the plan submitted by Captain Thomas Caldwell, which is accompanied by a neatly constructed model, it is proposed to dispense with the use of pumps, whenever a supply of water of sufficient elevation can be obtained. He proposes to construct a dock of about *twice* the usual length, to be divided into two compartments by gates situated near the centre of the structure; an additional pair of gates are placed at the *extremity*, opening a communication with the harbor. The vessel enters this *first* compartment; the *external* gates are then closed, and the *internal* opened. The bottom of the second compartment is *above the level of water* in the *first* or outer compartment, and is, consequently, at this period *dry*. The water is now permitted to flow from the elevated reservoir, through a pipe, into the docks; when, by this means, the surface is sufficiently elevated, the vessel is hauled into the *second* compartment, which is constructed in all respects similar to a dry dock; the central gates are then closed and secured, and the water is discharged into the adjacent harbor. This plan may be adopted in any situation, and is entirely independent of the tide, although this may occasionally be of some assistance.

All that is proposed in this place is to save the *difference* in the expense of erecting steam engines, or other powers applicable to pumps, together with the cost of maintaining them in operation, compared with the cost of pipes and of obtaining a supply of water. In the cost of these items some saving may, perhaps, be effected; but all plans of this description, however simple they may appear, must be *far more expensive* than any which are now in use. The money which would be required to construct the *external dock*, or rather lock, of which it is an exact resemblance, would be sufficient to construct one and perhaps two dry docks on the common plan; whilst the interior dock will require the expenditure of the sum usually required in addition to the former. Steam engines or other power could be maintained for a far less sum than the interest of the *extra* capital which we have mentioned above. The committee, therefore, cannot recommend this plan for adoption.

This method is by no means novel; it has been frequently described, but we believe never adopted.

In all docks from which it is necessary to remove the water, either by means of pumps or the action of the tide, some delay always occurs. It is sometimes important that ships should be enabled to proceed to sea with all possible expedition. This remark is applicable to our mercantile, but more especially to our national marine. The success of a naval expedition may depend on the promptness with which it can be equipped for sea. A single defective vessel may detain a whole squadron until the defect can be remedied.

The time lost in waiting for a single tide may be of consequence; hence docks from which the water is removed by powerful engines may, in some few cases, have advantages over those which depend on the tide for this purpose; the latter, however, are certainly more economical, both in their use and construction. The application of these remarks will be considered when we describe the plan of Commodore Barron.

The walls of dry docks necessarily exclude a considerable portion of the light; consequently the workmen are unable to perform their task early in the morning or late in the evening. Artificial illumination has sometimes been partially resorted to for the purpose of lessening the inconvenience. From the cause above mentioned, some inconvenience is experienced from the want of ventilation; hence the vessels in the dock cannot, when requisite, be expeditiously dried, unless by the aid of fire, the employment of which for this purpose has been productive of numerous accidents. An additional evil resulting from this dampness and want of ventilation may be observed in the diseases contracted by the workmen employed in such docks.

The hulks of old ships are sometimes employed in Europe as substitutes for stone dry docks; they are drawn ashore between high and low water mark, and carefully secured; the stern is cut off and replaced by a pair of gates; the hold is partly filled with ballast, to reduce the buoyancy of the ship; the vessels enter at high tide, and are immediately secured by shores, &c. The water is permitted to escape during the subsiding of the tide, and afterwards kept excluded from the interior of the dock during the time of repairing the vessel.

This plan may be sometimes successfully resorted to for small vessels, in cases of *emergency*, but it is inapplicable to ships of great magnitude. In addition to this objection, an enormous quantity of ballast is required; and, notwithstanding all the precautions which may be taken, accidents will sometimes occur from the employment of this insecure apparatus.

In the State of Maine, a plan similar to this has been attempted, but a vessel, in the form of a camel or rectangular trunk, has been substituted for the hulk previously mentioned. The least inequality *on the surface of the soil* on which it rests will endanger its stability by causing it to *warp*, and of course jeopardizing the safety of the vessel contained in it.

In addition to this, it can only be employed where the tide rises and falls many feet, unless pumps be used.

We now proceed to describe the ingenious plan submitted to us by Commodore James Barron, of the United States navy. It presents the appearance of a large scow, constructed in the strongest manner. The great simplicity of the features of this plan will render it perfectly intelligible by a mere inspection of the subjoined drawing, which represents a section of the dry dock:

[Here follows a diagram.]

D D D D, the dock k k, knees at the angle, bolted firmly to the horizontal and upright timbers D D D D; c c c c c, horizontal or inclined slips of ceiling, running fore and aft, into which the timbers D D D D are inserted; the external planking of the dock is to be well caulked; T T T T are air-tight trunks, to preserve the buoyancy of the dock when filled with water; V, the vessel in the dry dock; S S, two of the wale shores supporting the ship; p p, horizontal shores; B B, blocks under the keel.

Port holes, which may be rendered water-tight, similar to those in ships of war, are placed at suitable intervals in the sides of the dock; these will permit the access of light and air—a great advantage, which is not possessed by the docks now in use. These port holes also offer facilities for the introduction of timber, &c.

At the extremity of the dock, facing the harbor, the gate is placed; this may be of the usual form, or in detached parts, or the *floating gate* may be employed. The latter has been for a long time in successful operation in Europe.

If this dock be employed in salt water, where the worms are destructive to timber, it will be necessary to protect it with copper, &c. This will be requisite only on the bottom and sides; the latter will require coppering only as high as the floating line of the dock containing the vessel when the former contains no water. The same remark is applicable to the copper bolts. As the dock is exposed to little friction, the thinnest sheets of copper may be employed.*

We now proceed to describe the method of using this structure. When the gates are open the dock is full of water, and sinks to a depth to allow vessels to enter therein, and of course to displace their weight of water from the dock when the gates are closed and secured. The vessel is then shored, &c., in the usual manner employed in dry docks. The water must be removed either by common pumps, by Archimedes screws, or by a pump which forces out the water through an aperture in the bottom. This latter method is decidedly the best, for by means of it the water can be removed in one-fourth of the time which would be required by the first plan.

For the purpose of explaining this subject, we will describe the process of pumping out the water from a common dry dock, and the power which is requisite for this purpose, compared with the floating dock of Commodore Barron.

[Here follows diagram.]

In figure 2, D represents *a dry dock of the usual form*, S the ship, H A the level of the water in the harbor and dock, the line A B the depth of the dock—for instance, 20 feet.

At the *commencement* of the operation of pumping, as the *level* of the water in the dock and harbor is the same, no power is requisite to remove the water from the dock, (if the friction of the pumps be not considered;) as the pumping proceeds, the surface of the water in the dock sinks below the level H A of the water in the harbor; of course power is now required to *elevate* the water. The difference between the heights of these two surfaces continually increases until the last portion of the water in the bottom of the dock is to be removed, when the elevation to which the water must be raised is the greatest, viz: from B to A, (20 feet;) of course the greatest power is required at this period of the operation. Therefore, if every foot in depth of the dry dock contain equal quantities of water,† the average power required during the whole of the operation must be sufficient to elevate a quantity of water equal to the cubic contents of the dry dock, to a height equal to one-half of the depth A B of the dock D, viz: to the

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* If the experiments of Sir Humphrey Davy be conclusive, the copper may be perfectly protected from corrosion in salt water by employing iron guards. The adhesion of barnacles, &c., which may be the result of preventing the oxidation of the copper, will be no impediment whatever to the operations of the floating dry dock.

† In practice, the lower portion of the dock will, from the form of the ship, contain more water than the upper portion, and of course require more power and more pumping to remove it.

half of 20 feet, equal 10 feet, equal x A. This supposes that the level H A of the water in the harbor remains constant. In the floating dock of Commodore Barron, much less power is required to remove the water.

[Here follows a diagram.]

Let D D D D, figure 3, represent the floating dock, containing the ship S; H A the surface of the water in the harbor, which would coincide with the surface in the dock, supposing it to be sunk to the dotted line, which is its situation when full of water; this depth we suppose to be 20 feet, or equal to A B, figure 2. At the commencement of the operation of pumping the water from the floating dock, it resembles the common dock in not requiring any power to exhaust it; but, as the pumping proceeds, the dock becomes lighter, and of course the bottom does not remain in the same relative position to the surface of the water in the harbor, but rises in proportion to its buoyancy.

The above figure 3 represents this dock as having risen in consequence of the removal of the water H A, being the surface of that in the harbor; it is now immersed to the depth of A B only, which, in a dock of the magnitude hereafter to be mentioned, will be about 5 feet;* consequently, as the water is forced out through an aperture in the bottom, the greatest resistance to be overcome is equal only to the pressure of a column of water equal in height to the line A B, (5 feet;) half of this, or A $x=2\frac{1}{2}$ feet, will be the average resistance during the whole operation. Therefore, the power required to remove the water from the floating dock, by a forcing pump, will be to the power required to remove the water from a common dry dock, on the usual plan, as $2\frac{1}{2}$ to 10, or as 1 to 4, viz: as A x, figure $3=2\frac{1}{2}$ feet, is to A x, figure $2=10$ feet. If, however, lifting or forcing pumps be employed to pump the water up, and discharge it *over the sides,* the same power would be required both for the fixed and for the floating dock; of course the forcing pump previously mentioned will be adopted for the floating dock.

The dock of Commodore Barron is to be moored in a slip between two wharves or breakwaters, which will flank and protect it from injury; a raft or floating breakwater moored in the harbor in front of the dock gate will preserve it from damage by storms, &c.

The repairs of this dock can be effected with despatch and economy; if the bottom requires inspection, the dock can be hauled up on a common building slip, and examined.

No danger can be apprehended from the bottom or other parts of the dock warping; for this can be prevented by proper care in the construction.

Your committee have now fully and decidedly stated their opinion of the ingenuity, economy, the safety, and the perfect practicability of the valuable plan invented by Commodore Barron; but they would fail in gratifying their own feelings, as well as in the performance of the duty which they owe to the public, if they concluded this report without earnestly recommending this scheme to our mercantile community, for their immediate adoption.

The most prudent and cautious may be informed that the correctness of

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* As it will not be necessary to remove the water from the space occupied by the ballast, (represented by the shaded compartment in the lower part of the figure,) the additional depth to which the dock will sink will not affect the result of the calculation we have given.

the principles on which this dry dock is founded are so completely demonstrable, that success cannot fail to crown the efforts of those whose enterprise may induce them to attempt the establishment of a dock on this plan.

An able and faithful superintendent or engineer must be employed, as, without such supervision, every similar scheme will prove abortive.

The experiment may be tried on a small scale, by those whose caution induces them to dread the failure which may, by possibility, result from any plan which has not been frequently and successfully reduced to practice. In the event of a trial, only $4,400 need be expended on a floating dry dock calculated for the reception of vessels of 300 tons. Wharves and floating rafts, which will form a sufficient temporary protection, can be easily procured. Common pumps, worked by men or horses, will be sufficient to remove the water.*

If the experiment be successful, the most ample remuneration must inevitably be the reward of the proprietors; if the plan proposed be unsuccessful, the materials of which the dock will be constructed can be sold for $1,400, and a loss of $3,000 only can possibly occur. The lock can be finished in the short space of two months.

If the experiment on this scale be successful, (and of this the committee do not entertain the smallest doubt,) the most timid will not hesitate to try the plan on a larger scale, and with the additions thereto which convenience may require.

All which is respectfully submitted.

S. HUMPHREYS, *U. S. Naval Constructor.*
CHARLES STEWART, *U. S. Navy.*
A. J. DALLAS, *U. S. Navy.*
HARTMAN BACHE, *Top. Engineer.*
JOHN RANDEL, Jun., *Civil Engineer.*
GEO. W. SMITH.
† JOHN WILSON, *Civil Eng., of South Carolina.*

In the same volume of the Franklin Journal which contains the report on Barron's and Caldwell's docks (viz: vol. 3, p. 73, Feb. 1827) is "*a description of the American marine railway, as constructed at New York by Mr. John Thomas, naval architect, with explanations of its principles, and manifestations of its safety, for ships of war, by John L. Sullivan, civil engineer.*" This report embraces 12 pages of the journal, and is accompanied by two copperplate engravings. The marine railway referred to in the report of the commissioners is believed to be the same as that described by Mr. Sullivan.

In the same volume (p. 424) is a "*report of the Committee of In-*

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* The total expense of these items for a permanent establishment will not exceed $6,000, or the *total* expense for such an establishment will be only $10,400.

† It may be proper to state, that Mr. Wilson was present at several meetings of the committee, and approved of the notes then taken by the committee. As these required some alteration in their arrangement to render them fit for publication, and as Mr. Wilson was compelled to leave Philadelphia in the interval, it was impossible for him to attach his signature in time; and it has therefore been done during his absence. This explanation is due to him and to the public.

ventions of the Franklin Institute on the plan of a floating dry dock, invented by Edward Clark, civil engineer." This is accompanied by a copperplate engraving, which shows that Mr. Clark's is one of the class of tank docks which left the vessel's keel quite above the water. It is built between two piers, which have guide timbers up and down to steady the dock as it rises and falls, and to prevent its oversetting in consequence of carrying a heavy weight upon the top of boxes filled only with air.

In the same volume, (p. 99,) under the head Committee of Inventions, is a "*report on the radiating railways for the repair of vessels, invented by* Edward Clark, civil engineer, New York," [with a plate.]

... Franklin ... dry dock, in...
by Edward Clark, civil engineer." This is accompanied by a ... engraving, which shows that Mr. Clark's is one of the class of ... docks which lift the vessel a foot quite above the water. It is built between two piers, which have guide timbers up and down to steady the dock as it rises and falls, and to prevent its overturning in consequence of having a heavy weight upon the top of boxes filled only with air.

In the same volume, page 33, under the head Committee of Inventions, is a report on the "modifying dry-dock for the repairs of vessels," invented by Edward Clark, civil engineer, New York, [with a plate.]